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Practical Intelligence for School: Developing Metacognitive Sources of Achievement in Adolescence

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We sought to boost school achievement by creating an intervention that would develop practical intelligence for school in middle-school students. Researchers worked with teachers in Connecticut and Massachusetts schools over a 2-year period. Teachers were trained to deliver a five-part program developed to inculcate practical intelligence by emphasizing five sources of metacognitive awareness: knowing why, knowing self, knowing differences, knowing process, and revisiting. A broad range of assessments was administered in a pre–post design both to the children receiving the practical intelligence program and to matched control chil-

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dren. We found that the program successfully enhanced both practical and academic skills in each of the target skill areas (reading, writing, homework, and test-taking) in children from diverse socioeconomic backgrounds attending diverse types of schools. These results are discussed in terms of the acquisition of cognitive and metacognitive insights during adolescence and the promise such insights hold for enhancing adolescent achievement over and above traditional *g*-based approaches to learning. Finally, we discuss trade-offs between ecologically based and laboratory-based interventions. © 2002 Elsevier Science (USA)

A bright 9-year-old child shows one of his parents a paper he has written for his teacher. The parent comments that the paper seems to have some good ideas, but that it is messy and also full of spelling and punctuation errors. The child responds that the teacher does not care about those things, only about the ideas. The parent demurs, but does not argue. The child hands in the paper and is shocked to receive a low grade. It turns out, surprisingly to the child—but not to the teacher or parent—that the teacher *presumed* the students knew that neatness, spelling, and punctuation matter, and so the teacher focused instead on ‘‘coming up with good ideas’’ in the classroom discussion of the assignment. Somewhere along the way, however, the child was derailed.

This child is intelligent in the conventional sense of the term (see Neisser, 1979; Neisser et al., 1996; Sternberg, Conway, Ketron, & Bernstein, 1981) and yet seems to lack some kind of intelligence relevant to the school environment. This kind of intelligence, termed *practical intelligence for school,* refers to the individual’s understanding of, and ability to respond appropriately to, the demands of the school environment (Gardner, Krechevsky, Sternberg, & Okagaki, 1994; Sternberg, Okagaki, & Jackson, 1990; Williams et al., 1996). Included in this concept would be understanding and responding appropriately to things such as doing homework; taking tests; reading for understanding; and, as in the case of the child above, writing effectively.

Practical intelligence for school is a specific aspect of practical intelligence, which has been studied by a variety of investigators in a variety of contexts (see Ceci, 1996; Sternberg, 1996, 1999; Sternberg, Forsythe, Hedlund, Horvath, Wagner, Williams, Snook, & Grigorenko, 2000; Sternberg & Wagner, 1986; Sternberg, Wagner, Williams, & Horvath, 1995, for reviews). The basic idea is that over the course of development from middle childhood to early adolescence, individuals acquire a set of procedural-knowledge skills (i.e., skills that tell people what to do and how and when to do it) that are relevant to their adaptation to real-world environments. This set of procedural-knowledge skills is not well or fully conceptualized by conventional notions of intelligence and is not well measured by conventional intelligence tests. Although not all investigators accept the existence of such a construct (e.g., Ree & Earles, 1993; Schmidt & Hunter, 1993), there is sufficient evidence that it is worth pursuing on an empirical basis. At minimum, it can be viewed as a part of general intelligence, broadly defined, whether or not it is viewed as wholly distinct from the academic aspects of intelligence. For example, Ceci (1996) speculated that the introspective awareness that undergirds practical intelligence (e.g., realizing that a noisy cafeteria is not as optimal a place to study as a quiet room) may be the basis of so-called general intelligence, or *g,* because such insights are important in most aspects of academic success. Thus, even if one does not accept the independence of practical intelligence from *g,* there may nevertheless be an important role for practical intelligence to play in a broader perspective on cognitive competence.

Can intelligence, in general, or practical intelligence, in particular, be taught? Few questions in the field of developmental psychology are more difficult to answer and more contentious in the answers they have generated. As explained below, the scientific evidence is mixed and subject to alternative interpretations. Part of the confusion has to do with the way practical intelligence is construed, with some viewing it as a largely independent type of cognition or thinking (e.g., Gardner, 1983, 1999) and others (e.g., Ceci, 1996) viewing it as the product of the application of other forms of cognition to practical problems. In the present study, we conceived of practical intelligence as a derivative of metacognitive awareness. This guided our development of thematic exercises that focused on various forms of introspective awareness.

Suggesting that intelligence can, in fact, be taught are a number of controlled studies, some of them yielding impressive gains. One of the most well known is the evaluation of the ODYSSEY project. This project was designed to raise the intellectual skills and school performance of Venezuelan school children of roughly middle-school age and was evaluated with highly favorable results by Herrnstein, Nickerson, DeSanchez, and Swets (1986). Ramey (1994; Ramey & Campbell, 1984, 1992; Ramey et al., 1992; Ramey & Ramey, 1998), studying younger children, also has accumulated substantial evidence that gains in intelligence and school performance are possible as a result of intensive interventions among high-risk preschoolers. Affirmative evidence also comes from the STAR project in Tennessee, in which reduction in class size in a large randomized design elevated kindergarten through third graders' reading scores from the 50th percentile to the 60th percentile (Finn & Achilles, 1990, 1999; Mosteller, 1995). Other programs have also shown at least limited, and sometimes quite impressive, success (Bereiter & Engelmann, 1966; Feuerstein, 1980; Garber, 1988; Nisbett, Fong, Lehman, & Cheng, 1987; Schweinhart, Barnes, & Weikart, 1993; see also Detterman & Sternberg, 1982; Honig, 1994; Nickerson, 1994; Nickerson, Perkins, & Smith, 1985).

The verdict is not unanimous, however. Suggesting a negative answer are Herrnstein and Murray (1994), whose review of the literature led them to conclude that little meaningful intellectual gain is possible in intervention studies short of early adoption. Others have come to the same conclusion (Jensen, 1969, 1989; McLaughlin, 1977; Spitz, 1986, 1992), suggesting, at the least, that the evidence can be interpreted in different ways.

Perhaps the most defensible interpretations of intellectual intervention studies are those that are mildly encouraging, but at least somewhat skeptical (Consortium for Longitudinal Studies, 1983; Lazar & Darlington, 1982; Snow & Yalow, 1982; Zigler & Berman, 1983). Indeed, any responsible study might be placed into this category because no serious psychologist has suggested that unlimited gains are possible. Rather, the best that can be said is that modest to moderate gains can be obtained in some cases under limited circumstances.[1] Typically, any initial gains fail to accumulate or ‘‘fade out’’ over time. For example, the STAR program’s success was limited to the effect of a single year of reduced class size, with no systematic cumulative effects for subsequent years in smaller classes (Mosteller, 1995).

There could be various reasons why the evidence has been seen as mixed, some pertaining to the research itself and others pertaining to the ideological commitments of its interpreters. In the studies reported here, we tried to take into account two possible issues that might have engendered some of the mixed results of the past. First, our work was motivated by a clear guiding theoretical framework, a merger of Sternberg’s (1985, 1996) triarchic theory of intelligence and Gardner’s (1983, 1993) theory of multiple intelligences. Previous interventions have not typically been theory-driven (e.g., Lazar & Darlington, 1982; Zigler & Berman, 1983), instead relying on conventional activities and off-the-rack tests that are assumed to measure their impact. Second, we attempted to teach an extremely broad range of intellectual skills—those relevant to practical intelligence for school—rather than focus on skills targeted to more specific and, perhaps, clearly definable kinds of situations. By focusing on training a broad range of skills we hoped to improve students’ performances on various types of tasks students complete every day. We also focused our evaluation and assessment of our program upon these diverse competencies. Because previous research on training more specific skills showed that some skills are more trainable than others, we hoped that an emphasis on a broad range of skills would be likely to demonstrate overall positive effects of training for various skills involved in general scholastic performance.

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[1] Regardless of the specific conclusion, when evaluating research that attempts to increase intelligence, it is important to distinguish between increasing intelligence (broadly construed) and increasing IQ. Herrnstein and Murray (1994) reduce the first issue to the second; however, not all researchers would agree with this reasoning. Our focus in the present study was on enhancing those performances that reasonable individuals would consider to be intelligent for students in middle school (e.g., thinking critically, seeing oneself and one’s intellectual products from other people’s perspectives, managing one’s intellectual performances, applying strategies appropriate to different intellectual tasks, and so on).

THEORETICAL MOTIVATION

The theoretical motivation for our research is a combination of the theory of multiple intelligences proposed by Gardner (1983, 1993) and the triarchic theory of intelligence proposed by Sternberg (1985, 1996, 1999). The former theory, based on developmental, neurological, and various other forms of evidence,[2] proposes that intelligence can be understood in terms of seven distinct and relatively independent forms of intelligence: linguistic, logical-mathematical, spatial, musical, bodily-kinesthetic, interpersonal, and intrapersonal.[3] The latter theory proposes that intelligence has analytical, creative, and practical aspects. By viewing intelligence in each of the seven domains proposed by Gardner as having the three aspects proposed by Sternberg, we integrated these two theoretical frameworks.

For example, one could view linguistic intelligence, an important component of school success, as involving analytical aspects (e.g., of the author's intentions in writing a story or of whether a particular argument is persuasive), creative aspects (e.g., in writing a creative essay or a poem), and practical aspects (e.g., in writing or speaking persuasively so as to convince readers of the validity of one's arguments). One could view logical-mathematical intelligence as involving analytical aspects (e.g., in working accurately through the steps of a traditional mathematical proof), creative aspects (e.g., in discovering a novel approach for completing a mathematical proof), and practical aspects (e.g., in seeing a real-world analog of a mathematical equation and using this example to inform further thinking). The same merging applies to each of the other multiple intelligences.

Both theories have been applied in ways to boost both intelligence, in general, and school achievement, in particular (see, e.g., Gardner, 1993; Sternberg, Ferrari, Clinkenbeard, & Grigorenko, 1996; Sternberg & Spear-Swerling, 1996).[4] In this set of studies, we sought to boost school achievement by creating an intervention that would develop practical intelligence for school in middle-school students (Williams et al., 1996). This article reports on our evaluation of that intervention.

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[2] These include evolutionary antecedents of a given intelligence; the existence of a symbol system (e.g., dance notation and maps); the existence of special populations (e.g., geniuses and savants); and, importantly, potential isolation by brain damage (e.g., language and spatial reasoning).

[3] Subsequently, Gardner (1999) expanded his theory of intelligence to encompass an eighth form of intelligence, termed naturalistic intelligence.

[4] Although we distinguish between school-achievement-test performance and intelligence-test performance, this is not usually true among psychometric researchers (e.g., Scarr, 1997), who view *both* types of performance as *g*-loaded and hence correlated to the extent of their saturation on the first principal component or common factor.

METHOD

The intervention program is a curriculum intervention designed to enhance the practical-thinking skills of early adolescents, especially those in the fifth and sixth grades. We focused on fifth- and sixth-grade students because we believed that the point at which a child leaves primary school and enters intermediate school (usually around sixth grade) is a time when the child is ripe for instruction in practical-thinking skills. The child at this juncture is old enough to assimilate and use the skills (many of which require a degree of metacognitive awareness not usually evident in younger children), but young enough to be open to learning them.[5] Around the time of entry into middle school, the child's practical thinking skills become more essential as he or she must change classes several times a day and deal with the demands of different teachers and, for the first time, a limited number of elective courses.

Materials

Themes of the practical intelligence for school (PIFS) curriculum. Based on extensive classroom observation, teacher and student interviews, and a review of the literature on metacognitive awareness (Metcalfe & Shimamura, 1996), our research team identified five major questions or themes that helped us understand the focus and mechanics of practical-thinking skills. These themes became the basis of our curricular intervention, which we called the Practical Intelligence for School (PIFS) program. These five themes were further refined through discussions with teachers during the implementation and during subsequent revisions of the curriculum. Each theme focuses on an aspect of metacognitive awareness that pertains to a particular academic domain.

The first theme is *Knowing Why.* We believed that students would benefit from understanding the purposes behind the tasks they are asked to do in school. (What is the point of homework? Why is it important to read?) They also need to know how their school work relates to their extracurricular lives. (How is the writing they do inside of school like the writing they do for other reasons? What kinds of tests do adults face in their work, and how do classroom and standardized school tests help adults to prepare for these tests in later life?) Students would be aided by an awareness of how learning is relevant to their lives now and how they can use it to improve their lives both now and later.

The second theme is *Knowing Self.* Assessing one's own work and one's personal strengths and weaknesses is an integral component of practical competence, both in school and in life. The ability to capitalize on strengths and compensate for weaknesses is a prime benefit of self-knowledge. Recognizing their own current homework or reading habits and identifying the strengths and weaknesses in those habits is the first step students must take toward improving their work.

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[5] Our assumption is supported by Piaget's (1959) description of children's entrance into formal operations in adolescence.

The third theme is *Knowing Differences.* A working style that is very successful in handling math assignments may be ineffective in writing an essay. The differences among subject matters, and, therefore, the need to learn varied approaches to work, become more pronounced as students move through middle school and into high school. The PIFS lessons ask students to compare various kinds of assignments and subject matters to reveal their diverse demands. Once students can see differences, they can also begin to think critically and see connections between various aspects of school and also between school and life in general.

The fourth theme is *Knowing Process.* How should a student tackle an assignment or a problem? The classroom is a world of its own, and success in it requires an awareness of the academic process. The curriculum describes processes involved in completing work within four focal areas (discussed below)—reading, writing, homework, and testing. Students learn to recognize and define problems for themselves. Lessons help students plan their work, develop effective strategies for problem solving, and draw upon a wide variety of resources in overcoming difficulties.

The fifth and final theme is *Revisiting.* Each booklet in the PIFS curriculum focuses on a particular kind of reflection that is especially useful to its focal area: rereading texts, revising writing, reworking homework, and reviewing tests. Children learn that going the extra mile to review and revise is the hallmark of the successful student.[6] For example, metacognitive research by Beale (1996) has demonstrated that students who lack the insight needed to revisit incomprehensible text material can be trained to recognize the value of ‘‘revision,’’ and their scores benefit from this insight.

Contents of the practical intelligence for school (PIFS) curriculum. We focused the curriculum on four major areas in which students require practical intelligence to succeed in school. This is not to say that these are the only salient areas or that our curriculum addresses *all* the practical thinking skills children need. Rather, we focused on these four areas because our observations and interviews suggested that practical intelligence in each of these areas is important to school success. The four PIFS focal areas are reading, writing, homework, and testing. The PIFS curriculum contains five sets of lessons, organized into booklets: an introductory booklet, a reading booklet, a writing booklet, a homework booklet, and a testing booklet (examples of PIFS lessons from each of the five booklets are presented in Figs. 1–5; the reader should review these materials to gain an appreciation of the content of PIFS lessons before proceeding).

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[6] Readers familiar with other frameworks will recognize that our five-part approach covers similar conceptual ground. For example, Brown’s (1975) ‘‘Knowing, Knowing about Knowing, and Knowing How to Know’’ approach is represented in our first four themes, as are metacognitive strategy-training approaches, such as those studied by Pressley and others (e.g., O’Sullivan & Pressley, 1984; Pressley & Ghatala, 1990; Pressley, Levin, & Ghatala, 1984).

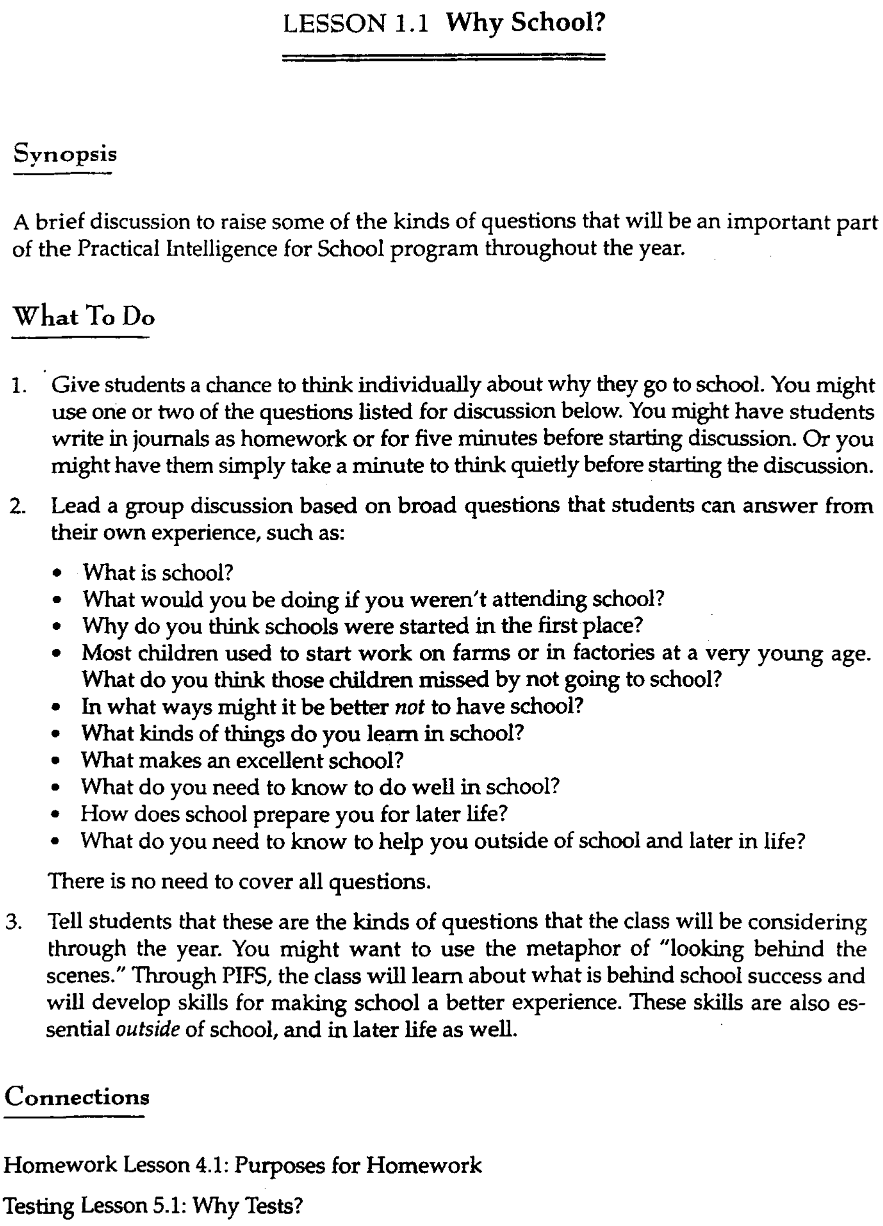
The *Introduction* to the PIFS curriculum (see Fig. 1) contains a series of lessons that asks students to think about the nature of school and why they attend it. Students also reflect on their own personal strengths and interests, developing a profile of themselves that they can use to help them draw their interests into future school assignments. The *Thoughtful Reading* booklet (see Fig. 2) invites students to consider the role that reading plays in adult life. They develop their own reading profiles and identify their best strategies for overcoming difficulties in reading. They also compare and contrast different kinds of reading. *Expository Writing* lessons (see Fig. 3) cover the practical side of planning, writing, and revising clear, coherent pieces that convey students' ideas, incorporate their particular interests, and capitalize on their strengths.

The *Homework Planning and Execution* booklet (see Fig. 4) covers issues such as understanding the purposes of homework, identifying personal strengths and weaknesses in homework habits, developing organizational skills, and making use of a variety of resources to overcome homework problems. Finally, *Preparing for and Using Feedback from Tests* (see Fig. 5) includes lessons in which students discuss the importance of and uses for tests; develop important classroom and study skills like listening carefully, taking notes, and memorizing; practice various study strategies in preparing for tests; anticipate and plan for problems they might encounter while testing; and, finally, consider how best to make use of feedback from tests.

Comment on Conducting Ecologically Valid Research in Public School Classrooms

Before we describe the details of the methods and procedures used to select sites, teachers, and students and to implement the PIFS program, we wish to consider the limitations and constraints inherent in conducting ecologically valid research in public school classrooms. Our goals included, first, implementing the PIFS program in a diverse group of schools (urban, suburban, and rural) containing students of diverse socioeconomic levels from various racial and ethnic backgrounds. Second, we sought to work with typical teachers using typical classroom curricula and facing typical constraints upon their teaching imposed by their schools and administrations, as well as by students' parents. Our third goal was to implement the program for an entire school year and not simply for a handful of tightly controlled lessons in a laboratory experiment setting. In general, we wanted the implementation of PIFS to take place in an ecologically valid and naturalistic setting.

Because of these goals, we did not attempt to force randomly selected



LESSON 1.1 **Why School?**

Synopsis

A brief discussion to raise some of the kinds of questions that will be an important part of the Practical Intelligence for School program throughout the year.

What To Do

1. Give students a chance to think individually about why they go to school. You might use one or two of the questions listed for discussion below. You might have students write in journals as homework or for five minutes before starting discussion. Or you might have them simply take a minute to think quietly before starting the discussion.
2. Lead a group discussion based on broad questions that students can answer from their own experience, such as:
   - What is school?
   - What would you be doing if you weren't attending school?
   - Why do you think schools were started in the first place?
   - Most children used to start work on farms or in factories at a very young age. What do you think those children missed by not going to school?
   - In what ways might it be better *not* to have school?
   - What kinds of things do you learn in school?
   - What makes an excellent school?
   - What do you need to know to do well in school?
   - How does school prepare you for later life?
   - What do you need to know to help you outside of school and later in life?

   There is no need to cover all questions.
3. Tell students that these are the kinds of questions that the class will be considering through the year. You might want to use the metaphor of "looking behind the scenes." Through PIFS, the class will learn about what is behind school success and will develop skills for making school a better experience. These skills are also essential *outside* of school, and in later life as well.

Connections

Homework Lesson 4.1: Purposes for Homework

Testing Lesson 5.1: Why Tests?

FIG. 1. Excerpts from the Introduction of the *Practical Intelligence for School* (PIFS) program.

Reading Lesson 2.1: Why Read?

Writing Lesson 3.1: Writing In School and Out

Follow-Up Activity

Whenever students start a new activity or project, have them think about *why* they are being asked to do it. How does it fit in with other things they do for school? What might they learn? How is it like what people do outside of school?

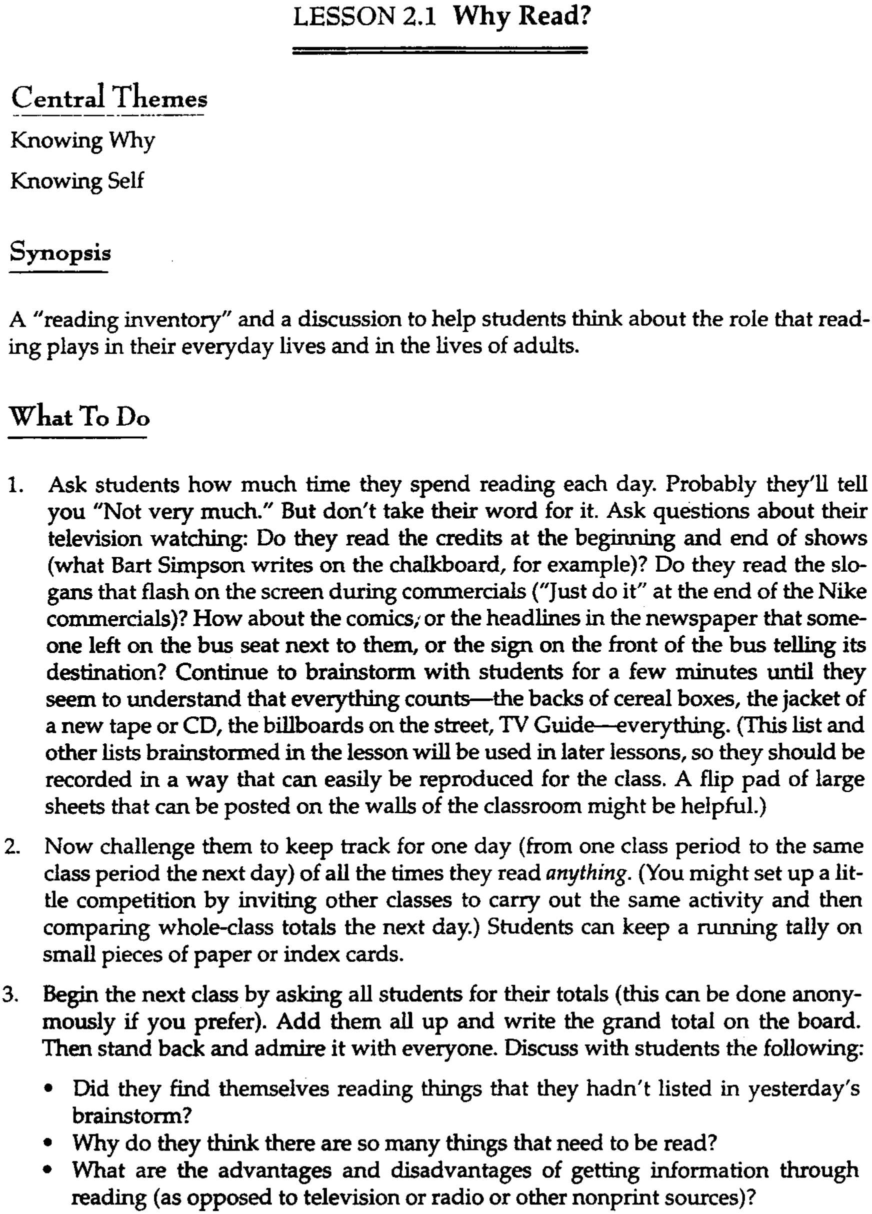
FIG. 1—*Continued*

teachers from randomly selected schools to participate in our program. First of all, it is difficult if not impossible—and possibly even unethical—to demand that a principal and his or her teachers participate in a year-long curricular intervention. Instead, we met with principals and asked them to review our materials and decide if they believed participation would be advantageous for their schools. Once a principal had agreed, we solicited the names of interested teachers and met with these individuals. From this group of interested teachers, the control-group and experimental-group teachers were assigned, at this point randomly, with control teachers being told they would receive all of the experimental materials after the study was completed.

We selected teachers whose students had been grouped into heterogeneous classes at the end of the previous school year. These classes were created by the principals and administrators to be equivalent with regard to gender and achievement level—thus, each experimental class and paired control class in our study contained equivalent numbers of gifted, average, and learning-disabled students. We recognize that our method did not constitute true random selection of schools, teachers, and students, but given the commitment we required from teachers, it would have been impossible to obtain a fair evaluation of the potential of our program by forcing teachers to comply—nor could we or even the administrators of the schools have successfully pressured experienced, tenured teachers in this way.

The students in our study were not told they were part of an experiment; their teachers simply taught for 1 school year from the perspective we advocated and using the materials we supplied. Thus, in the eyes of the students, this was business as usual. The students were also unaware that the assessments used by the researchers were being used outside of the classroom—the students knew only that these assessments were being used by their teachers to measure their progress, as was the case with all classroom (nonstandardized) tests.

During the PIFS implementation, the researchers observed and met with teachers to ensure that PIFS lessons were being covered, but we made no attempt to force teachers to read from prepared scripts of curricula, word



LESSON 2.1 Why Read?

Central Themes

Knowing Why

Knowing Self

Synopsis

A "reading inventory" and a discussion to help students think about the role that reading plays in their everyday lives and in the lives of adults.

What To Do

1. Ask students how much time they spend reading each day. Probably they'll tell you "Not very much." But don't take their word for it. Ask questions about their television watching: Do they read the credits at the beginning and end of shows (what Bart Simpson writes on the chalkboard, for example)? Do they read the slogans that flash on the screen during commercials ("Just do it" at the end of the Nike commercials)? How about the comics, or the headlines in the newspaper that someone left on the bus seat next to them, or the sign on the front of the bus telling its destination? Continue to brainstorm with students for a few minutes until they seem to understand that everything counts—the backs of cereal boxes, the jacket of a new tape or CD, the billboards on the street, TV Guide—everything. (This list and other lists brainstormed in the lesson will be used in later lessons, so they should be recorded in a way that can easily be reproduced for the class. A flip pad of large sheets that can be posted on the walls of the classroom might be helpful.)
2. Now challenge them to keep track for one day (from one class period to the same class period the next day) of all the times they read *anything*. (You might set up a little competition by inviting other classes to carry out the same activity and then comparing whole-class totals the next day.) Students can keep a running tally on small pieces of paper or index cards.
3. Begin the next class by asking all students for their totals (this can be done anonymously if you prefer). Add them all up and write the grand total on the board. Then stand back and admire it with everyone. Discuss with students the following:
   - Did they find themselves reading things that they hadn't listed in yesterday's brainstorm?
   - Why do they think there are so many things that need to be read?
   - What are the advantages and disadvantages of getting information through reading (as opposed to television or radio or other nonprint sources)?

FIG. 2. Excerpts from the ''Thoughtful Reading'' chapter of the *Practical Intelligence for School* (PIFS) program.

- What would their lives be like if they couldn't read?
- What would the world be like if there were no such thing as reading or writing?

4. Help students to think about the role that reading plays in adult life by doing one or more of the following activities:
   - If possible, invite community members to your class to talk about when reading is useful to them in their jobs (a volunteer from a literacy program is a possibility).
   - Alternatively, the students could write letters to celebrities as well as local people to ask about their reading habits. (A similar activity is proposed in the writing section, so students might write a single letter asking both questions.)
   - Or, students might simply suggest particular jobs and list the sorts of reading those jobs might entail.

5. Next, help students think about how the reading they do in school compares to the kinds of reading they (and adults) do outside of school. Have students list the different kinds of reading they do in school (encourage them to think about *all* subjects, including math) and how this reading differs from the reading they do out of school. Probe their responses—even the simple and superficial ones. If, for example, students claim that the reading they do in school is boring and pointless, ask them to make some guesses about why it is assigned. Ask them to compare their school assignments with some of the reading examples that they tallied, as well as with the types of reading adults say they do for their jobs. Which kinds of reading are most similar to their school reading? You might also ask them what in general would make school reading more tolerable for them, as well as what they themselves might do to make it better. (Lesson 3 takes up this point more fully.)

Connections

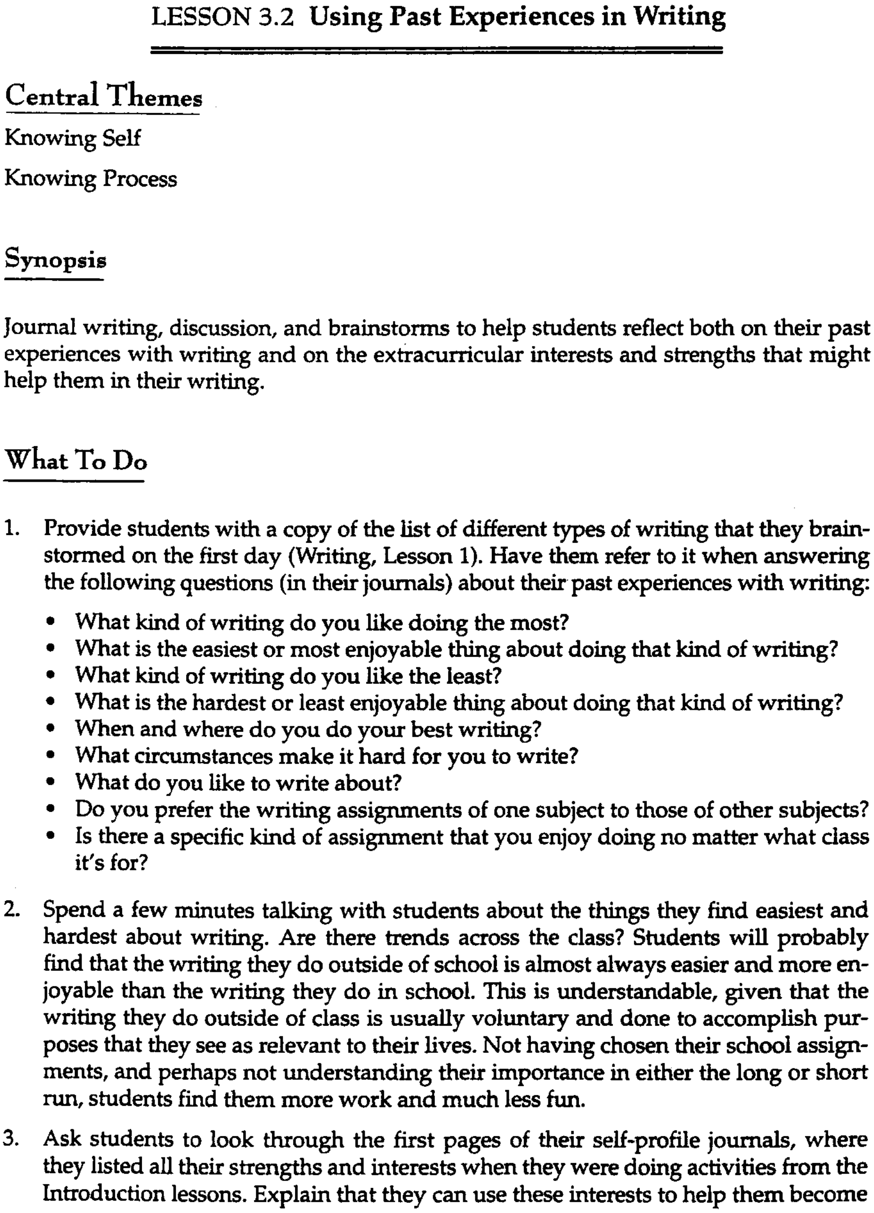
Introduction Lesson 1.1: Why School?

Writing Lesson 3.1: Writing In School and Out

Follow-Up Activities

1. Ask students to survey people in their community (storekeepers, police officers, teachers, parents, siblings) about what they read and why. Each week, ask two or three students to interview one person each. At the end of the week, they can report their findings, which can be recorded in a public place in the classroom.
2. If you teach in a self-contained classroom, take a few minutes each week to discuss reading in one subject other than language arts. Invite students to make connections and find differences in the purposes for reading in their various subjects.

FIG. 2—*Continued*



LESSON 3.2 Using Past Experiences in Writing

Central Themes

Knowing Self

Knowing Process

Synopsis

Journal writing, discussion, and brainstorms to help students reflect both on their past experiences with writing and on the extracurricular interests and strengths that might help them in their writing.

What To Do

1. Provide students with a copy of the list of different types of writing that they brainstormed on the first day (Writing, Lesson 1). Have them refer to it when answering the following questions (in their journals) about their past experiences with writing:
   - What kind of writing do you like doing the most?
   - What is the easiest or most enjoyable thing about doing that kind of writing?
   - What kind of writing do you like the least?
   - What is the hardest or least enjoyable thing about doing that kind of writing?
   - When and where do you do your best writing?
   - What circumstances make it hard for you to write?
   - What do you like to write about?
   - Do you prefer the writing assignments of one subject to those of other subjects?
   - Is there a specific kind of assignment that you enjoy doing no matter what class it's for?
2. Spend a few minutes talking with students about the things they find easiest and hardest about writing. Are there trends across the class? Students will probably find that the writing they do outside of school is almost always easier and more enjoyable than the writing they do in school. This is understandable, given that the writing they do outside of class is usually voluntary and done to accomplish purposes that they see as relevant to their lives. Not having chosen their school assignments, and perhaps not understanding their importance in either the long or short run, students find them more work and much less fun.
3. Ask students to look through the first pages of their self-profile journals, where they listed all their strengths and interests when they were doing activities from the Introduction lessons. Explain that they can use these interests to help them become

FIG. 3. Excerpts from the "Expository Writing" chapter of the *Practical Intelligence for School* (PIFS) program.

more interested in, and so improve at, writing assignments. They can incorporate their interests, experiences, and strengths into their assignments.

4. Give the class a report topic that comes from the normal curriculum for this week (something that you would have assigned anyway). The best topics for this exercise are fairly focused, but not so much as to prevent the students from shaping the topics to their thoughts. Write the report topic on the board. For the purposes of illustration, let's say that your class is currently studying colonial America.

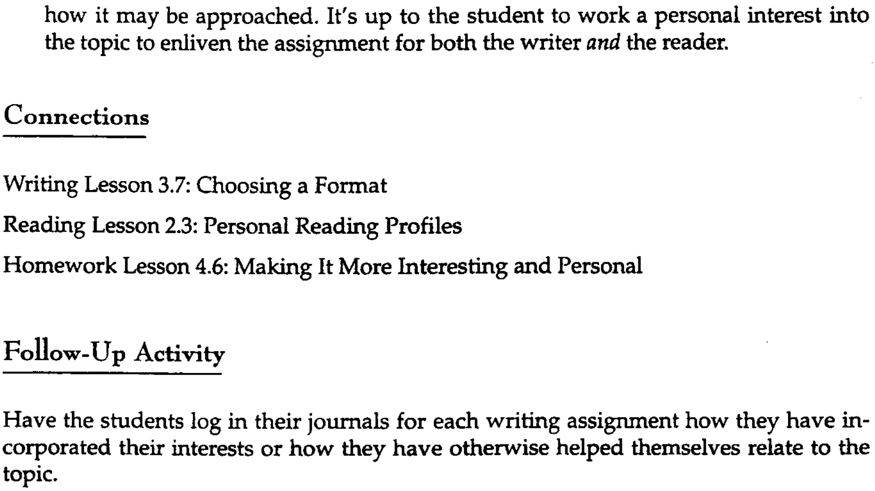
5. Have each student think of at least three ideas for a writing assignment (e.g., a writing project or report) about this topic that could incorporate a personal interest or area of expertise. (You might want to do a few out loud to help students get the hang of it.) Lists might include ideas like these:
    - *Drawing*. Focus on a topic that lends itself to illustrations (types of dress or housing).
    - *Computer/video games*. Design and write a manual for a role-playing game about life in colonial times; players might win or lose points depending on how well they survive the boat trip, make friends with natives, build weather-resistant homes, and so on.
    - *Acting*. Write a play about some aspect of life in colonial America.
    - *Skateboarding*. Report on transportation in colonial times (how people got around, how much people traveled, who traveled).
    - *Making up stories*. Write some diary entries of a colonial teenager.
    - *Medicine*. Write about illnesses and cures common in colonial America.
    - *Food*. Write a few entries for a colonial cookbook; recipes could include ingredients available to colonial Americans, tips for how to store food, cooking devices.
    - *Getting into trouble with the law*. Describe what people in colonial America could be punished for, as well as how they were punished.
    - *Entertainment*. Write about what young people did for fun in colonial America.
    - *Music*. Describe the music people liked then, and how people listened to it. (If the writing requirements are loose, students might also write a rap or song about an event like the Boston Tea Party or the Salem witch trials.)
    - *Animals*. What animals did people in colonial America use for pets? What animals did they hunt, or did they fear? How were animals a part of their daily lives?

6. Ask some of the students to share their ideas from this exercise. For each idea, have the class brainstorm a few possible sources of information (*besides* a textbook or encyclopedia) that might be helpful to consult.

7. Ask if anyone had an interest that he or she just couldn't relate to the topic in any way. If so, see if the class as a group has any ideas. Consider: Are there certain things that simply won't relate to the given topic? Are there ways of looking at an interest in a broader light that might make it relate better to the topic (as in the earlier skateboarding example)?

8. Discuss the advantages and disadvantages of choosing these more unusual topics. Conclude by stressing that every assignment has a certain amount of leeway in

FIG. 3—*Continued*



how it may be approached. It's up to the student to work a personal interest into the topic to enliven the assignment for both the writer *and* the reader.

Connections

Writing Lesson 3.7: Choosing a Format

Reading Lesson 2.3: Personal Reading Profiles

Homework Lesson 4.6: Making It More Interesting and Personal

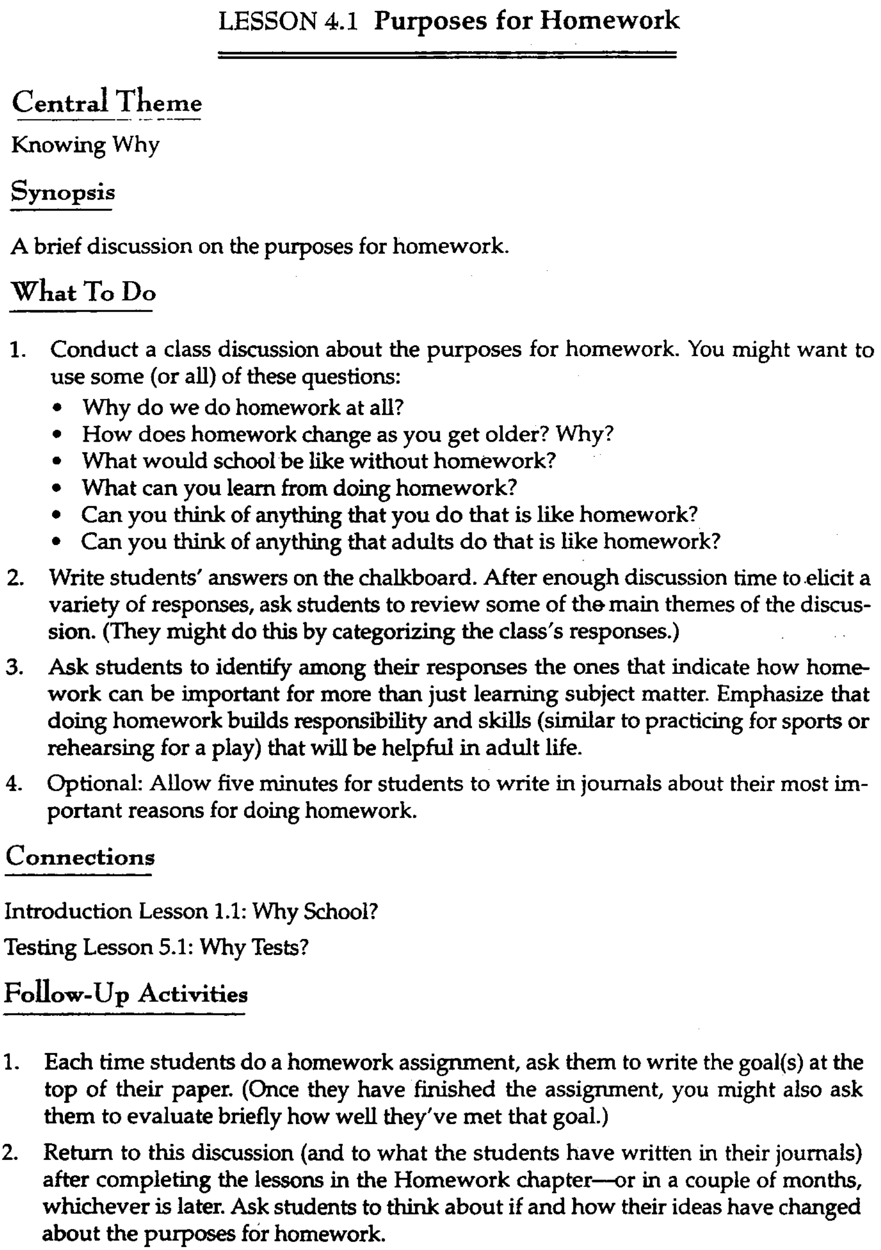
Follow-Up Activity

Have the students log in their journals for each writing assignment how they have incorporated their interests or how they have otherwise helped themselves relate to the topic.

FIG. 3—*Continued*

for word. To attempt to constrain teachers in this way might have created an artificial environment which the teachers would have resisted (appropriately so) and to which the students would have responded negatively. Thus, the classrooms in which we worked were not tightly controlled experimental settings; they were typical public school classrooms. Our belief was that differences in implementation across teachers—an inevitable result of teachers' differing styles, methods of expression, attitudes, and preferences, as well as of students' individual needs—would average out on balance across the experimental and control classrooms throughout the study. We recognize that some teachers emphasized slightly more heavily certain curricular themes that they felt more comfortable with; however, we believed that our naturalistic approach was not only more ethical than a tightly controlled experimental approach, but also more true to the eventual conditions under which PIFS would be used in the world beyond our study, in the event that the curriculum came into broad circulation. Our study was a first attempt at evaluating PIFS. Future research can benefit from the success of this early work and possibly explore individual differences among teachers in greater detail.

In sum, our goal was to conduct ecologically valid research in public school classrooms, not tightly controlled artificial research in a laboratory setting. Thus, our goal and the methods necessitated by this goal require us to openly acknowledge the experimental limitations of our approach: (a) self-selection of teachers who were then randomly divided into experimental and control groups; (b) lack of pure random assignment of students by researchers (rather, use of typical, intact classes comprised of heterogeneously



LESSON 4.1 Purposes for Homework

Central Theme

Knowing Why

Synopsis

A brief discussion on the purposes for homework.

What To Do

1. Conduct a class discussion about the purposes for homework. You might want to use some (or all) of these questions:
   - Why do we do homework at all?
   - How does homework change as you get older? Why?
   - What would school be like without homework?
   - What can you learn from doing homework?
   - Can you think of anything that you do that is like homework?
   - Can you think of anything that adults do that is like homework?
2. Write students' answers on the chalkboard. After enough discussion time to elicit a variety of responses, ask students to review some of the main themes of the discussion. (They might do this by categorizing the class's responses.)
3. Ask students to identify among their responses the ones that indicate how homework can be important for more than just learning subject matter. Emphasize that doing homework builds responsibility and skills (similar to practicing for sports or rehearsing for a play) that will be helpful in adult life.
4. Optional: Allow five minutes for students to write in journals about their most important reasons for doing homework.

Connections

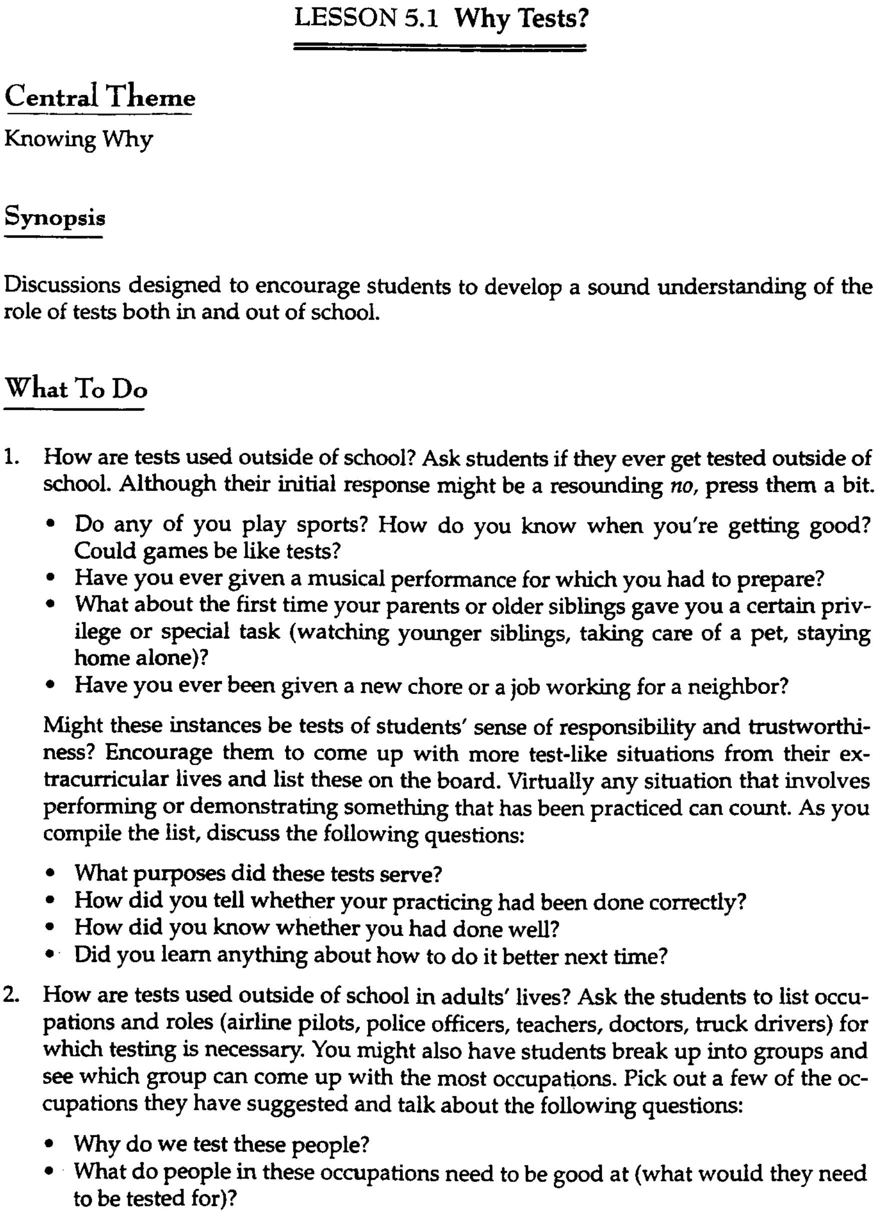
Introduction Lesson 1.1: Why School?

Testing Lesson 5.1: Why Tests?

Follow-Up Activities

1. Each time students do a homework assignment, ask them to write the goal(s) at the top of their paper. (Once they have finished the assignment, you might also ask them to evaluate briefly how well they've met that goal.)
2. Return to this discussion (and to what the students have written in their journals) after completing the lessons in the Homework chapter—or in a couple of months, whichever is later. Ask students to think about if and how their ideas have changed about the purposes for homework.

FIG. 4. Excerpts from the ''Homework Planning and Execution'' chapter of the *Practical Intelligence for School* (PIFS) program.



LESSON 5.1 Why Tests?

Central Theme

Knowing Why

Synopsis

Discussions designed to encourage students to develop a sound understanding of the role of tests both in and out of school.

What To Do

1. How are tests used outside of school? Ask students if they ever get tested outside of school. Although their initial response might be a resounding *no*, press them a bit.
   - Do any of you play sports? How do you know when you're getting good? Could games be like tests?
   - Have you ever given a musical performance for which you had to prepare?
   - What about the first time your parents or older siblings gave you a certain privilege or special task (watching younger siblings, taking care of a pet, staying home alone)?
   - Have you ever been given a new chore or a job working for a neighbor?

   Might these instances be tests of students' sense of responsibility and trustworthiness? Encourage them to come up with more test-like situations from their extracurricular lives and list these on the board. Virtually any situation that involves performing or demonstrating something that has been practiced can count. As you compile the list, discuss the following questions:
   - What purposes did these tests serve?
   - How did you tell whether your practicing had been done correctly?
   - How did you know whether you had done well?
   - Did you learn anything about how to do it better next time?
2. How are tests used outside of school in adults' lives? Ask the students to list occupations and roles (airline pilots, police officers, teachers, doctors, truck drivers) for which testing is necessary. You might also have students break up into groups and see which group can come up with the most occupations. Pick out a few of the occupations they have suggested and talk about the following questions:
   - Why do we test these people?
   - What do people in these occupations need to be good at (what would they need to be tested for)?

FIG. 5. Excerpts from the ''Preparing for and Using Feedback from Tests'' chapter of the *Practical Intelligence for School* (PIFS) program.

- What sorts of tests might people in these occupations be given to see if they have the necessary skills?
- What could happen on the job if these people were not tested?

You might also discuss with them the less formal tests that adults encounter every day. A teacher teaching a class, for example, is undergoing a kind of test, as is the firefighter confronting a burning house. The process of applying for a job is also like taking a test. Share with the students some of the everyday tests that you go through, how you get feedback about your performance, and how that feedback helps you to make plans for future situations.

3. How are tests used in school? Ask students to list the sorts of tests they take in school. Discuss with them a series of questions like the ones listed in item 2:

   - Why are tests used in school?
   - What do tests tell teachers? Parents? Students? How can they use this information?
   - Do some subjects lend themselves to testing more readily than others (math versus English; science versus art)?
   - What would school be like without tests? (Ask for both pros and cons.)
   - Would you feel uncomfortable not knowing what your grades and academic standing are?
   - What might happen in school if students weren't tested?

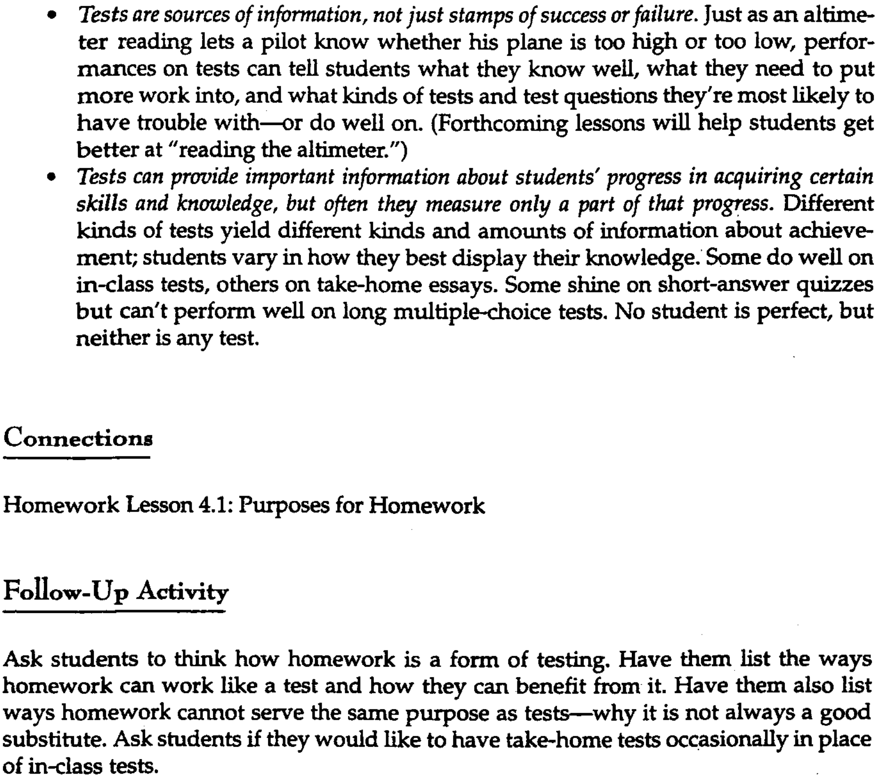
4. Finally, ask students to compare the list of school tests with the two lists of outside-school tests. How are the lists different? How are they the same? The most obvious distinction is likely to be that most of the tests on the school list are written, and customarily receive a number or letter grade. On the other hand, many of the tests on the outside-school list will be "performance" assessments, in which the test-taker actually demonstrates a particular skill and is judged accordingly (perhaps pass-fail).

5. Ask students to think about testing situations that involve both a pencil-and-paper component and a performance component: driving tests, CPR certification tests, auto mechanic exams, surgeons' evaluations. What does each half of the test tell about the test-taker? If they were only given written tests (or only performance tests), what would be left out? Then ask students to think about school pencil-and-paper tests in this light: What can and can't they measure? Get concrete examples here. A spelling test, for instance, might demonstrate how well you can memorize, but won't show how well you can use a dictionary. A timed math test might show how quickly you can add and subtract, but won't tell how resourceful you can be in figuring out how to do a puzzling problem.

   There are three important points to make from all of these discussions:

   - *Tests aren't simply a school phenomenon.* They are an omnipresent part of life, so it makes sense to think about how to do them well and how to use them to advantage.

FIG. 5—*Continued*



- *Tests are sources of information, not just stamps of success or failure.* Just as an altimeter reading lets a pilot know whether his plane is too high or too low, performances on tests can tell students what they know well, what they need to put more work into, and what kinds of tests and test questions they're most likely to have trouble with—or do well on. (Forthcoming lessons will help students get better at "reading the altimeter.")
- *Tests can provide important information about students' progress in acquiring certain skills and knowledge, but often they measure only a part of that progress.* Different kinds of tests yield different kinds and amounts of information about achievement; students vary in how they best display their knowledge. Some do well on in-class tests, others on take-home essays. Some shine on short-answer quizzes but can't perform well on long multiple-choice tests. No student is perfect, but neither is any test.

Connections

Homework Lesson 4.1: Purposes for Homework

Follow-Up Activity

Ask students to think how homework is a form of testing. Have them list the ways homework can work like a test and how they can benefit from it. Have them also list ways homework cannot serve the same purpose as tests—why it is not always a good substitute. Ask students if they would like to have take-home tests occasionally in place of in-class tests.

FIG. 5—*Continued*

grouped students); and (c) lack of word-for-word scripted reading of curricular materials, but, rather, individual tailoring of lessons to fit teachers' and students' needs, styles, and preferences.

Sites

The PIFS curriculum was implemented two separate times over 2 consecutive years. This implementation took place at sites in Connecticut and Massachusetts within reasonable driving distance of the Yale and Harvard research teams. The schools were chosen to span a range of environments and populations, with differing profiles of academic needs, so that we could evaluate the usefulness of this intervention in inculcating practical intelligence under varying circumstances. (Details of the site and teacher selection procedures are discussed below under ''Procedure.'')

Connecticut sites. For both Year 1 and Year 2 of the implementation, three public schools in Connecticut contributed two sixth-grade classes and one fifth-grade class to the study. These schools were in rural and predominantly

White communities, with a mix of socioeconomic levels. Three other classes within the same school district served as control groups not receiving the program; two of these classes were in two schools that also contributed experimental classrooms. All six classrooms were self-contained. The classes averaged 15 students each.

Massachusetts sites. For the first year of the implementation, the Massachusetts sites also contained three public schools, which contributed two combined fifth/sixth-grade classes and four sixth-grade classes. The combined fifth/sixth-grade classes were self-contained classes in elementary schools. The sixth-grade classes were taught by a team of four teachers (one language arts, one reading, one math, and one combined science-and-social-studies teacher). All Massachusetts sites were urban. The students were White, African-American, Asian, and Hispanic and came from a broad mix of socioeconomic levels. Two comparable sixth-grade classrooms in a nearby urban, middle-, and lower-middle-class community served as control groups. The class sizes ranged from 15 to 25 students.

In Year 2, the Massachusetts sites included three public schools in the Boston area, serving lower- and middle-class communities with student populations that are African-American, Hispanic, and White. One teacher implemented the curriculum in her self-contained classroom that included both fifth- and sixth-graders. At another school, a team of three teachers implemented the program with their shared sixth-graders. Matched control students were selected from these same schools, but did not receive the PIFS curriculum. In addition, the Harvard research team worked with teachers who implemented PIFS for sixth- through eighth-graders in a suburban school 25 miles north of Boston.

Participants

Connecticut sites. In Year 1, 87 students from northwestern Connecticut served as participants (43 girls and 44 boys). Their ages ranged from 10 to 13 years with a mean of 11.33 ($SD = .62$). Participants were fifth- ($n = 29$) and sixth-grade ($n = 58$) students. Forty-four participants (in three classes) received the PIFS program and 43 participants (in three classes) served as controls. The PIFS and control groups were equivalent with respect to age, sex, and achievement level. This information is determined by the school principals and administrators at the end of each school year and is used to group students for the upcoming school year into heterogeneous classes (two classes per grade) with equivalent numbers of gifted, average, and learning-disabled students.

In Year 2, 106 students from the same region participated (51 girls and 55 boys). Their ages ranged from 9 to 12 years with a mean of 10.68 ($SD = .64$). Participants were fifth- ($n = 42$) and sixth-grade ($n = 64$) students. Fifty-four participants (in three classes) received the PIFS program and 52 participants (in three classes) served as controls. The PIFS and control groups were equivalent with respect to age, sex, and achievement level (as a result of the class-grouping procedure described above).

Massachusetts sites. In Year 1, 109 students from the Boston, Massachusetts, area served as participants (59 girls and 50 boys). Their ages ranged from 9 to 13 years with a mean of 11.15 ($SD = .70$) years. Participants were fifth- ($n = 17$) and sixth-grade ($n = 92$) students. Sixty-one participants (in three classes) received the PIFS program and 48 participants (in two classes) served as controls. One of the PIFS classes was team taught. The PIFS and control groups were equivalent with respect to sex and achievement. The PIFS participants were younger ($M = 11.02$ years old, $SD = .83$) on average than the control participants ($M = 11.31$, $SD = .47$), unequal variance $t(98) = 2.35$, $p < .05$, although this difference represented less than 3.5 months.

In Year 2, 212 students from the same area participated (105 girls and 107 boys). Their ages ranged from 9 to 13 years with a mean of 11.33 ($SD = .82$) years. Participants were fifth- ($n = 20$), sixth- ($n = 156$), seventh- ($n = 26$), and eighth-grade ($n = 10$) students. There were 144 PIFS participants (in six classes) and 68 control participants (in two classes). One PIFS class and one control class were team taught. The composition of the PIFS and control groups was equivalent with respect to sex and achievement level (again, classes consisted of mixed-ability groups of students of different levels of ability and achievement). The PIFS participants were older ($M = 11.41$ years old, $SD = .88$) on average than the control participants ($M = 11.19$, $SD = .67$), unequal variance $t(167) = 1.97$, $p = .05$, although this difference represented less than 3 months.[7]

Procedure

Background and selection procedures. To select schools, the researchers first consulted demographic data to create a master list of acceptable sites. Next, the school principals were contacted by letter and asked for a meeting. At this meeting, the researchers described the program and asked if the principal would allow her or his school to participate. If so, the principal was asked to canvass the teachers to create a list of interested faculty. The researchers then met with interested teachers and explained what would be required to participate in the program. The most interested teachers offered their names for further consideration. These teachers were then randomly divided and assigned to either the experimental or control condition, with the control teachers being informed that they could have the program to teach after the study was concluded.

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[7] Due to limitations inherent in conducting research in inner-city, urban schools containing challenged populations, the Harvard research team was unable to achieve a perfectly matched experimental-control group design in which the numbers of students and classes were the same for both conditions and in which the classes were drawn from the same school districts.

In both implementation years, experimental-group teachers approached the teaching of PIFS lessons as though these lessons were a normal part of the curriculum. Students were not told the material was ‘‘extra work’’ or ‘‘enrichment,’’ they were simply taught from the PIFS perspective rather than from the more traditional purely academic perspective. The assessments used to evaluate PIFS, which were administered to all students (experimental and control), were also used by teachers to evaluate their students’ proficiency in reading, writing, homework, and test taking. The use to which the researchers put these assessments was unknown to the students, who viewed the assessments as simply a part of normal classroom procedure.

Year 1. Throughout the first year-long implementation, the researchers worked closely with all teachers implementing PIFS. Teachers were introduced to the curriculum over the summer. The Connecticut teachers met with the Yale research team regularly over the summer to review the curriculum and refine the implementation plan. Similarly, the Massachusetts teachers met with the Harvard research team over the summer to review the curriculum and to make plans for the school year. During the school year, each teacher (or team of teachers, in the case of the Massachusetts middle-school site) met with a researcher approximately once a week to review the lessons taught; to consider the successes, problems, and questions that had arisen; and to plan how best to continue with the curriculum.

In Year 1, all teachers began the PIFS curriculum by working through the lessons in the introductory booklet. Once these introductions were completed, we encouraged teachers to use subsequent booklets (and lessons within the booklets) in the order that best met the needs of their students and their standard curriculum. For instance, one teacher felt that her students needed first to develop the organizational skills addressed in the homework booklet and so began by leading her class through all six lessons of that booklet. Another teacher wanted her students to practice note taking and reading skills as they carried out their fall social studies project. She began with a mix of lessons from the reading and testing booklets. Although such variability in the implementation of the program imposes inevitable constraints on generalizations from the present results, we felt this effect was more than offset by gains in ecological validity. Plus, in working with teachers over the course of a year-long program, it was necessary to be flexible in our demands, since each teacher had her or his own way of conducting classes and since teachers resist rigid outsiders who attempt to tell them exactly how to do their jobs. Through weekly meetings with and observations with teachers and classes, the researchers ensured that the PIFS curriculum was being taught appropriately by all teachers, despite the individual teachers’ customization of the lessons to meet their own and their students’ needs.

Teachers typically focused on one lesson per week. In the days following that lesson, teachers referred back to the particular skill or idea presented in that lesson as they worked with students on their standard curriculum. For example, on the day after presenting the lesson about recognizing differences in various kinds of reading, one teacher asked her students to compare their science reading (a textbook passage) to the story they had read for homework: How were the two different? Did they read the textbook differently than the story? During a math lesson 2 days later, she asked the students to discuss why they did not read as much in math as they did in science or language arts. Such repetition in a variety of contexts fostered the students' deep and flexible grasp of PIFS ideas.

Year 2. In the second year of implementation, the researchers worked with a revised and streamlined version of the curriculum, which had benefitted from extensive comments and feedback generated by the teachers as they implemented the program in Year 1. By Year 2, the teachers were quite familiar with the program. Thus, throughout Year 2, the teachers worked more independently and attended fewer meetings with researchers.

In Year 2, the Massachusetts and Connecticut teachers followed somewhat different implementation procedures. The Massachusetts teachers implemented the PIFS program with an emphasis on customizing the PIFS lessons more than they had done in the previous year: They focused on the ideas or lessons that they believed to be most important for their students. Their instruction included infusing PIFS ideas into regular schoolwork as well as doing stand-alone lessons. The Connecticut teachers, on the other hand, emphasized broader coverage of the curriculum than they had been able to manage in the first year (an enrichment approach). Connecticut teachers typically covered one or two complete PIFS lessons per week, returning in the context of other subjects to the ideas introduced in the lessons. The Connecticut classes thus received about 90% of the lessons.

In general, in Year 2, all of the teachers took control of the PIFS curriculum and became active leaders and adapters of the program, with the goal of meeting their students' needs. Although we acknowledge that this enhanced level of teacher control meant that we had less precise say in how PIFS was taught, we believed that the condition of greater teacher control more closely mimicked how our program would be used by teachers once our formal study and evaluations had ended. Thus, we believed that the data generated during Year 2 would be an ecologically valid test of the effects of the PIFS program under more typical conditions of use.

Assessments

Description. In Year 1, we developed pretests and posttests designed to assess the quality of students' practical knowledge in each of the four focal areas (reading, writing, homework, and testing). All of the tests were based on the kinds of tasks students are typically asked to do in school to make them fair to students not exposed to the curriculum.

We used two reading assessments, one based on a factual passage (e.g., ‘‘The Intelligence of Elephants’’) and the other on a passage of fiction (e.g., an allegory about a talking elephant). Students read the passage and answered questions about their general understanding, their thinking processes while reading, the parts they found easy or hard to understand and why, how they would study for a test on the passage, the differences between the two passages, and so on. Most of the questions were open-ended. Each reading assessment took approximately 50 min.

The writing assessment involved two parts, each of which lasted 50 min. The first part of the pretest asked students to write a composition describing in detail a place they knew well. For the posttest, students described a person they knew well. Following the writing, students answered questions about their writing process—what was easy or hard, how they got their ideas and organized their presentation, and what their teacher's reaction might be (e.g., ''What will your teacher like MOST about your composition? LEAST?''). For the second part of the writing assessment, students revised the composition they wrote on the first part. They then reflected on the revision process, indicating the parts they had added or deleted, explaining those changes, and predicting what the teacher might and might not like about the piece.

For the homework assessment, teachers began by assigning a typical homework task that was relevant to the standard curriculum. Students were not told that the assignment was anything out of the ordinary. The following day, students were given a sheet of questions asking them to reflect on the processes involved in doing the homework. The questions asked the students to write about why they thought the homework was assigned, how they gathered information to do the work, what was easy or hard (and why), how they dealt with the hard part, how they could make this homework more interesting to do, and how their teacher would assess the assignment.

The testing assessment was built into the other assessments in two ways: First, two of the three assessments were treated as tests when administered to the students; and second, some of the assessments included questions about how the student would take notes and study for a test on a given passage or topic (e.g., ''Imagine that you will have a quiz on 'The Intelligence of Elephants' next week . . . Use the space below to make some notes on the article that will help you prepare for the quiz. Now describe what you would do to study for the quiz'').

In Year 2, we developed refined versions of our Year 1 assessments that required fewer administration sessions (in response to the fact that the time requirement had presented a problem in Year 1). Year 2's assessments were completed in 4 days rather than 5 or 6. To achieve this goal, we reduced the two-part assessments to single assessments that could be given in a single class period. This revision reduced the time burden on students and teachers associated with evaluating the curriculum and also reduced the likelihood that the researchers would be left with half-completed assessments due to absences (particularly common in the urban schools). Each individual assessment still took 50 min.

As just noted, the reading assessment was reduced from two parts to one. Students read two brief passages, one fiction and one nonfiction on similar topics (e.g., the first battle of the American Revolution in 1775), and then answered questions that asked them to compare and contrast the two passages (e.g., ‘‘List at least 3 ways in which these two passages are the same. List at least 3 ways in which these two passages are different’’). Students also described a personal experience that related to the topic, listed strategies for getting through a difficult reading assignment, and identified situations outside of school in which reading plays a crucial role.

The writing assessment also was reduced to a single task followed by questions. Students wrote a letter to their teacher convincing him or her not to give homework on weekends and answered the following questions about their work: What will their teacher like or not like about their letter? How do they overcome problems when they have trouble writing? How would they revise the letter if they had time? (e.g., ‘‘Name 3 or more things you could improve about your letter if you had time to revise it’’).

The testing assessment consisted of two 50-min parts. The first part measured students’ use of strategies on a standardized test: The assessment involved a lengthy set of multiple-choice questions of varying degrees of difficulty and worth varying point values. The most difficult questions were not always worth the most points (the point values were indicated next to each question). Students were told at the beginning that they would not have time to complete all questions, but that they should try to earn as many points as possible. (Due to time constraints, the first part of the testing assessment could be used only in the Connecticut schools). The second part of the testing assessment (given in all schools) asked students to describe their study strategies for a language arts test, to compare these strategies to ones they would use to study for a social studies test (e.g., ‘‘Name 3 strategies you should use to study for a social studies test that you should NOT use to study for an English test; Name 3 strategies you should use to study for BOTH tests’’), and to contrast how they would study for a multiple-choice versus an essay test. Students also were asked how they would overcome difficulties if they got stuck on a test, and they were asked to identify situations in which adults have to take tests.

In the homework assessment, students considered the case of ‘‘Mike,’’ a hypothetical student who has a variety of overnight assignments and small projects that need to be completed in a week (e.g., read an English story, define words in it, and write a paragraph about it; solve 10 math problems; read about a group of Native Americans in the text and then choose another group of Native Americans not covered in the text and write a report about it; and do an experiment at home consisting of placing cheese in a jar and observing it for 4 days and write a one-page report about it).

The students were asked to spell out what Mike should do each day to get all his work done on time, given the other constraints on his time (e.g., ‘‘Starting after school at 3:30, Mike spends time with friends or on the phone;

just before dinner, he watches his favorite TV show; after dinner until bed at 10, he usually does homework; on Monday he has to watch his baby brother from 4 to 9; on Thursday afternoon he has a basketball game''). Students also are told about how Mike works (e.g., ''Math is his best and favorite subject; he does OK in science; English and social studies are the hardest subjects for him; if he likes the work he finishes with no problem; if he doesn't like it, he gets distracted easily and has trouble finishing''). Students then were asked to describe how they would approach the variety of homework assignments by filling in a planning grid for Monday through Friday stating ''What Mike Should Do'' and ''Why'' for each day. For the balance of the homework assessments, students described the various resources they would use for completing a report on Native Americans, and they described how they might incorporate their own interests within their report.

Administration. The pretests were given in October over the course of a week (and sometimes also on Monday of the subsequent week), approximately one assessment each day. The posttests were given in the same manner in June.

Scoring. Yale and Harvard researchers collaboratively developed a 5-point rating scheme for each test, in which a 1 was defined as ''No Ability—very poor or essentially blank,'' a 2 as ''Low Ability—poor but shows effort,'' a 3 as ''Some Ability—generally good answer,'' a 4 as ''Good Ability—very solid effort and performance,'' and a 5 as ''High Ability—excellent in every respect.'' Each score was further defined with specific examples of student work that corresponded to that score. Separate scoring keys and sets of student work were developed for each academic and practical measure, reflecting the different emphases of academic and practical thinking skills. The same levels of relative and absolute performance were associated with the scores from 1 to 5 for both academic and practical measures, in both Years 1 and 2, at both the Connecticut and Massachusetts sites. Once the scorers had studied the anchors for the scale, they referred back during scoring to a key that contained the student examples corresponding to each score. Assessments were scored by three independent raters blind to student group membership (students' names, classes, teachers, and schools were masked and pretests and posttests were intermixed).

To clarify the details of the scoring procedure, consider the example of the writing assessment for Year 2. The task was to ''write a letter to your teacher explaining **why** students should not have homework on weekends. Try to write a letter that will make your teacher agree with you.'' Following the composition, one of the questions (measuring practical intelligence) that the student was asked states, ''Name 3 things your teacher will like about the way you wrote your letter.'' How was a practical-writing score arrived at for this particular question? Scorers looked for the degree to which the student had a sense of how to make an appropriate argument in writing and for how accurately the student judged her writing. Scorers began by assigning a general score of high, middle, or low to each individual answer. For this question, a high score went to students who stated: ‘‘I showed the kid’s point of view,’’ ‘‘I explained my thoughts clearly,’’ and ‘‘I went straight to the point.’’ A middle score went to students who stated: ‘‘It was neat,’’ ‘‘I wrote many reasons,’’ ‘‘I put all my punctuation marks in,’’ and ‘‘My vocabulary.’’ A low score went to students who stated: ‘‘Do it right,’’ ‘‘I don’t know,’’ and ‘‘Ask the teacher.’’

In general, for all of the practical questions on all of the assessments, ‘‘low’’ was assigned when students gave no response or an inappropriate or irrelevant response or wrote something such as ‘‘I don’t know.’’ ‘‘Middle’’ was assigned when a student’s response consisted of a ‘‘verbal molecule,’’ a simple statement that is appropriate, but obvious or stereotypical and indicates no deep thought or detailed explanation (such as ‘‘I would ask for help’’). ‘‘High’’ was assigned when the response was original and personally appropriate, showing a knowledge of oneself, why the question was asked, how to think effectively about the question, seeing how one question differs from the others, and so on. After all practical-intelligence questions were scored in the same manner, the relative numbers of high, middle, and low scores were tallied across all writing questions. The tallying of all high, middle, and low scores was then used to compute the score on the 1-to-5 scale, which was done as follows: 1 meant that all responses were low, with the exception of at most one middle; 2 meant that roughly half of the responses were low and half middle; 3 meant that responses averaged to middle (allowing for roughly balanced low and high); 4 meant that roughly half the responses were middle and half high; and 5 meant that all responses were high, with at most one exception. Another way to think about this 1-to-5 scale is in terms of its being anchored from No Ability to High Ability (as described above).

Turning now to the scoring of the academic-intelligence portion of the writing assessment, the academic-intelligence score for writing was based on the actual letter the students composed, which was evaluated for format, language, and mechanics. Scorers looked for the degree to which students understood the purposes for giving and completing homework, wrote well-substantiated arguments with valid reasons, noted the benefits resulting from not giving homework and why, and wrote with clarity and good organization. Scores on the 1-to-5 scale were assigned, with a 1 being *poor or unsatisfactory* (the letter was poorly written with numerous grammatical errors and does not present a solid argument) and a 5 being *excellent* (the letter was organized and clearly written with persuasive and realistic arguments that explained points well). Intermediate scores corresponded to intermediate-quality answers. (As described above, elaborate answer keys with specific examples of student work corresponding to each score were used in all scoring.)

Consider one other example, that of the homework assessment for Year

2 (measuring practical intelligence). The task was to design a plan to accomplish a week's worth of homework for a hypothetical student named Mike (''What Mike Should Do'' and ''Why'' had to be filled in for each day). The assignments were clearly described: But how would Mike be able to accomplish them, given the other demands on his time (such as babysitting and playing basketball, also described)? The answers were scored by looking at the student's sense of the process of doing homework, as indicated by how well the plan takes into account all constraints upon Mike's time; whether the student's explanations of her or his choices were appropriate and detailed; and how well the different elements of the plan fit together.

For example, a high response included the following: ''*Monday:* Set up science before babysitting—Have to start experiment. Do math while babysitting—Math can be done while babysitting cause it's easy. Read story from 9 to 10—Gotta start English cause it's hard. *Tuesday:* Check cheese after dinner and take notes—Have to check science every day. Write English paragraph—English is due Wednesday. Read social studies and pick group—Social studies is big assignment so have to start early [and so on for Wednesday through Friday, completing all assignments on time.]'' Middle and low scores were given for correspondingly weaker answers.

Before turning to the quantitative results, let us review all of the types of scores that were used in this research. In Years 1 and 2, for the reading and writing assessments, students received both a practical and an academic score. The practical score reflected performance on the practical-intelligence questions; the academic score reflected performance on the academic-intelligence questions.

In Years 1 and 2, for the homework assessment, students received only a practical score, because the nature of the questions (which involved reflecting about an actual homework assignment in Year 1 and how to plan to accomplish a week's worth of homework in Year 2) did not provide a basis for rating the academic quality of a sample of actual homework. (Academic scores for the actual teacher-generated homework assignments in Year 1, as graded by the classroom teachers, yielded incomparable data across classrooms and were not used. In other words, different teachers gave very different types of assignments that could not be comparably graded across classrooms: some classes did compositions, some did short answers to questions about readings, some did project work, etc. The actual homework assignments were thus used in this research solely as triggers of student reflection about their homework techniques.)

Regarding the academic- and practical-testing scores, no explicit academic-testing rating was given in Year 1 because the academic scores in reading and writing (i.e., the ''academic summary'' score) were equivalent to a general academic score for testing. (In other words, the reading and writing assessments were tests which yielded academic scores representing measures of test-taking ability). In Year 2, in the Connecticut schools, an explicit measure of academic-testing ability was administered, yielding an explicit academic-testing score. In Year 1, scores for practical-testing ability were based on answers to questions regarding how a student would study for specific tests (these questions were included in the reading and writing assessments). In Year 2, scores for practical testing were based on students' performance on the testing assessment described above, in which students compared and contrasted their study strategies for various types of tests in various content areas.

RESULTS AND DISCUSSION OF QUANTITATIVE DATA

Below we present results for two separate years of curriculum implementation and for two separate sets of schools, the Connecticut and the Massachusetts sites. First, we describe Years 1 and 2 results for the Connecticut sites (''Study 1''), and second, we describe Years 1 and 2 results for the Massachusetts sites (''Study 2''). The data were viewed as representing two separate studies because of the many differences between the Connecticut and Massachusetts schools (e.g., rural versus inner-city urban and White versus racially mixed) and because of the differing implementation procedures followed in the two states as a result of distinct academic needs and scheduling demands. Academic-intelligence measures (described above under ''Assessments'') consisted of assessments of reading, writing, and testing ability. We also computed an academic-intelligence summary measure representing the mean of reading and writing scores. Practical-intelligence measures (also described above) consisted of reading, writing, homework, and testing ability. We also computed two practical-intelligence summary measures—one representing the mean of reading and writing scores (''practical-2,'' comparable to the academic summary score) and the other representing the mean of reading, writing, homework, and testing scores (''practical-4,'' representing all practical-intelligence measures).

Before describing the quantitative results, let us reiterate the limitations of our approach: (a) self-selection of teachers, who were then randomly divided into experimental and control groups; (b) lack of pure random assignment of students by researchers (rather, use of typical, intact classes comprised of heterogeneously grouped students); and (c) lack of word-for-word scripted reading of curricular materials, but, rather, individual tailoring of lessons to fit teachers' and students' needs, styles, and preferences.

Study 1: Connecticut Site Results

Rating reliability. Practical and academic performance ratings showed good interrater reliability for both Year 1 and Year 2. The median reliability for Year 1 was .85 (range = .66 to .91). The median reliability for Year 2 was .86 (range = .82 to .92).

Means and standard deviations. The mean practical and academic scores for Year 1 and Year 2 are presented in Table 1. The Year-1 means for individual variables at pretest and posttest ranged from 2.68 ($SD = .47$) to 3.73 ($SD = .74$) on the 5-point rating scale. For Year 2, the means of the same variables ranged from 2.29 ($SD = .70$) to 4.09 ($SD = .69$). The Year-2 academic testing mean, based on a (very challenging) 100-point test, ranged from 35.06 ($SD = 12.69$) to 50.01 ($SD = 13.37$). The summary variables, also presented in Table 1, show a range of means and standard deviations that is similar to that of the individual variables.

Gender differences. Although we had no gender-related hypotheses, we examined the data for gender differences because these differences, where they exist, are of interest to some readers. For Year 1, girls tended to score higher than boys at pretest and posttest. Several of these gender differences were significant. For example, on the homework-practical scores the means at pretest were 3.20 ($SD = .60$) for girls and 2.77 ($SD = .75$) for boys, $F(1, 77) = 11.07$, $p < .01$. The posttest means were 3.72 ($SD = .78$) for girls and 3.17 ($SD = .72$) for boys, $F(1, 77) = 10.69$, $p < .01$. However, there were no significant differences between boys and girls on pretest–posttest improvement and no significant interactions between gender and the PIFS treatment.

For Year 2, similar to the Year-1 results, girls tended to score higher than boys at pretest and posttest. Several of these gender differences were significant (academic writing and all practical variables). There were no significant gender main effects on pretest–posttest improvement and no interactions between gender and the PIFS treatment.[8]

Academic-intelligence variables. Analyses of covariance were conducted on all academic- and practical-intelligence variables using the pretest score for each measure as the covariate and comparing the fall-to-spring score changes for the PIFS and control group students. The resulting ANCOVA *F* values appear in Table 1 in the rows titled ‘‘Comparison of Differences.’’ Data are reported separately for Years 1 and 2 of the study. The individual *t* tests conducted on the fall-to-spring changes *within* the PIFS or control conditions are also reported in Table 1 (for both the PIFS and control conditions) in the rows labeled ‘‘Difference *t*.’’

In general, for Year 1, there were pretest-to-posttest increases for both the PIFS and control groups. However, the PIFS group was not significantly different from the control group at posttest on the academic-intelligence variables. For Year 2, the PIFS and control groups were approximately equal at pretest. Both the PIFS and control groups increased at posttest. The PIFS group gains were significantly greater than the control group gains, showing beneficial effects of the PIFS curriculum on each type of academic work.

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[8] The detailed data and analyses of gender differences are available from the first author.

TABLE 1

Study 1: Connecticut Site Means and Standard Deviations with Significance Tests ($n = 193$)

Group	Variable	Reading practical	Writing practical	Homework practical	Testing practical	Reading academic	Writing academic	Testing academic	Practical-2 summary (R, W)	Practical-4 summary (R, W, H, T)	Academic summary (R, W)
YEAR 1 ($n = 87$)											
PIFS ($n = 44$)	Pre	2.70 (.69)	2.76 (.56)	2.77 (.63)	2.89 (.54)	2.81 (.66)	3.08 (.81)	—	2.73 (.48)	2.78 (.49)	2.94 (.65)
	Post	3.68 (.69)	3.07 (.86)	3.53 (.86)	3.55 (.58)	3.33 (.73)	3.18 (.73)	—	3.38 (.53)	3.45 (.52)	3.26 (.56)
	Diff *t*	7.69***	4.06***	6.32***	9.20***	4.44***	<1.00 n.s.		9.10***	12.09***	3.72***
Control ($n = 43$)	Pre	3.22 (.65)	2.68 (.47)	3.20 (.73)	3.40 (.55)	3.22 (.86)	2.83 (.66)	—	2.95 (.45)	3.13 (.48)	3.02 (.64)
	Post	3.73 (.74)	3.02 (.70)	3.37 (.73)	3.51 (.80)	3.03 (.68)	3.03 (.68)	—	3.39 (.69)	3.41 (.63)	3.21 (.62)
	Diff *t*	5.66***	3.33**	1.63 n.s.	1.46 n.s.	1.25 n.s.	1.93 n.s.		5.44***	4.57***	2.21*
Comp. of diffs.	*F*	6.64*	<1.00 n.s.	8.41**	12.65***	<1.00 n.s.	<1.00 n.s.		2.21 n.s.	15.16***	<1.00 n.s.
YEAR 2 ($n = 106$)											
PIFS ($n = 54$)	Pre	2.75 (.91)	2.49 (.75)	2.53 (.88)	2.39 (.77)	3.17 (.98)	2.48 (.86)	35.06 (12.69)	2.61 (.74)	2.50 (.72)	2.81 (.82)
	Post	3.54 (.61)	3.31 (.75)	3.35 (.91)	3.08 (.77)	4.09 (.67)	3.16 (.84)	50.01 (13.37)	3.40 (.64)	3.28 (.64)	3.58 (.70)
	Diff *t*	7.52***	9.89***	6.99***	6.23***	6.38***	6.67***	8.42***	11.99***	14.32***	8.14***
Control ($n = 52$)	Pre	2.61 (.78)	2.60 (.66)	2.93 (.86)	2.29 (.70)	3.09 (.94)	2.58 (.58)	36.78 (11.25)	2.62 (.67)	2.67 (.65)	2.88 (.69)
	Post	2.95 (.79)	2.82 (.84)	2.86 (.76)	2.61 (.61)	3.58 (.72)	2.68 (.87)	44.46 (15.70)	2.89 (.75)	2.85 (.64)	3.15 (.70)
	Diff *t*	3.07**	2.61*	1.00 n.s.	3.39**	3.70***	1.08 n.s.	3.16**	3.66***	3.24**	2.99**
Comp. of diffs.	*F*	19.37***	25.33***	27.89***	10.36**	13.63***	16.49***	5.71*	29.98***	60.89***	17.44***

$^{*}p < .05$; $^{**}p < .01$; $^{***}p < .001$.

For the academic summary score (based on reading and writing ability), the covariate-adjusted posttest improvement was .47 points greater for the PIFS group compared to the control group, which is a 17% larger gain (above the sample's pretest mean) for the PIFS participants. For the academic testing score, the covariate-adjusted posttest improvement was 6.55 points greater for the PIFS group compared to the control group, which is an 18% larger gain for the PIFS participants.

One note concerning summary scores: For summary scores (academic, practical-2, and practical-4), it should be noted that if a participant was missing one or more scores (e.g., homework-practical), then the summary score was the mean of the remaining scores. The summary score, as it now stands, can be viewed as the best available measure of the academic or practical effect of PIFS (vs no PIFS) because these scores use all of the available data for each participant. (However, a subnote is that for academic Year 2, testing-academic is not part of the academic summary score because it would make this score conceptually different from Year 1 scores and Massachusetts' academic scores for which no academic testing measure was collected.)

Practical-intelligence measures. For Year 1, there were pretest-to-posttest increases for PIFS and control groups. The PIFS group gains were significantly greater than the control group gains on reading, homework, testing, and the practical-4 summary scores (representing the mean of reading, writing, homework, and testing). On these variables, the PIFS participants began lower than the controls at pretest but PIFS participants overcame this initial difference and matched the posttest gains by controls. For the practical-4 summary score, the covariate-adjusted posttest improvement was .34 points greater for the PIFS group compared to the control group, which is an 11% larger gain over the sample's pretest mean for the PIFS participants.

For Year 2, the PIFS and control participants started equal at pretest and showed pretest-to-posttest increases. The PIFS group gains were significantly greater than the control group gains for all parts of the curriculum. For the practical-4 summary score, the covariate-adjusted posttest improvement was .56 points greater for the PIFS group compared to the control group, which is a 21% larger gain above the sample's pretest mean for the PIFS participants.

Teacher (or class) differences. As expected, there was some variability between teachers (or individual classes), presumably due to different instructional emphases and patterns of learning in different classes. In Year 1, for example, one PIFS teacher's class showed relatively large pretest–posttest gains on the homework-practical score (an increase of 1.60) compared to the other teachers' classes (which had an average increase of .37). However, this same teacher's class showed relatively small reading-practical gains (.55 compared to the other teachers' classes which averaged 1.17). For the PIFS teachers (classes), this variability was significant (at the $p = .05$ level) for reading-academic, writing-academic, reading-practical, and homework-practical scores. Control teachers also showed significant variability on reading-academic, academic-summary, reading-practical, homework-practical, testing-practical, and both practical-summary scores (practical-2 and practical-4).[9] Perhaps the most important finding with regard to individual teachers (classes) was that PIFS teachers (classes) showed significantly greater gains from pretest to posttest, compared to control teachers, for all practical measures except writing.

For Year 2, similarly to Year 1, there was some variability between teachers (or classes). For the PIFS teachers (classes), this variability was significant only for homework-practical and testing-practical scores. For control teachers, this variability was significant for reading academic and academic-summary scores. All PIFS teachers (classes) showed pretest to posttest gains for all parts of the curriculum.

It should be noted that we cannot distinguish teacher differences from class differences; each teacher has a certain selection of students (a class). The ‘‘teacher’’ differences may simply represent differences due to the samples of students that form each class. For example, one class of students may have been strong on homework regardless of who taught the class.

Student evaluation form. The student evaluation form was used only at the Connecticut sites. It was designed to be completed by teachers, and it described how well each child performed both generally and specifically with regard to PIFS skills. The form asked the teachers to rate each student on a 1-to-9 scale in terms of her or his grades, general behavior, and attendance. It then asked teachers to evaluate the extent to which each student recognized and incorporated personal strengths into schoolwork, compensated for weaknesses, questioned the purpose of school, made connections between subjects and ideas, used different approaches and a variety of resources, persevered with work, organized time, and sought feedback.

The student evaluation form results showed that PIFS teachers observed significantly more improvement in their students overall than did control teachers from October to June. The PIFS students’ mean rating moved from 6.24 (Fall) to 7.16 (Spring), an increase of .92 on a 1-to-9 scale. The control students’ mean rating moved from 5.55 (Fall) to 5.82 (Spring), an increase of .27 units. The relatively higher PIFS gain was significant, $t(68) = 3.50$, $p < .001$.

PIFS teachers observed significantly greater improvements than control teachers in the following areas: recognizing and making use of personal strengths and interests, noticing differences across subject matters, using different approaches in different subjects, using a variety of resources, persevering in the face of difficulties, organizing time and materials, and seeking and using feedback. There was no significant change in grades or general behavior in class. PIFS students showed less improvement than control students in attendance and the tendency to speculate about the purposes of studying particular topics or doing particular tasks. In general, however, the trend was positive for the PIFS students as compared to the control students.[10]

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[9] Due to the space required to present these data in detail, and due to the fact that we do not interpret the teacher (class) differences beyond simply stating that some significant differences were observed, we do not present the pretest and posttest means, standard deviations, and comparative analyses for every teacher here. These data are available from the first author.

Study 2: Massachusetts-Site Results

Rating reliability. Practical and academic performance ratings showed adequate interrater reliability for Year 1. The median reliability was .68 (range = .50 to .85). For Year 2, before full-scale scoring was undertaken, 20% of the assessments were scored by a second judge to establish reliability. Once the raters agreed on 80% of their scores, independent scoring commenced.

Means and standard deviations. The mean practical and academic scores for Year 1 and Year 2 are presented in Table 2. The Year-1 means for individual variables at pretest and posttest ranged from 2.01 ($SD = .57$) to 3.22 ($SD = .78$) on the 5-point rating scale. For Year 2, the means of the same variables ranged from 1.37 ($SD = .49$) to 2.82 ($SD = .59$). The summary variables, also presented in Table 2, show a range of means and standard deviations that is similar to that of the individual variables.

Gender differences. In Year 1, girls tended to score higher than boys at pretest and posttest. The differences were significant for the writing-academic, academic-summary, reading-practical, homework-practical, testing-practical, and the practical-summary scores. There also were significant gender main effects for pretest–posttest improvement favoring girls over boys on writing-academic, academic-summary, testing-practical, and practical-summary variables. There were significant interactions between gender and PIFS treatment for reading-practical, writing-practical, and the practical-summary scores.

In Year 2, girls tended to score higher than boys at pretest and posttest. The differences were significant for the academic variables, writing-practical, testing-practical, and the practical-summary scores. There also were significant gender main effects for pretest–posttest improvement favoring girls over boys on reading-academic and homework-practical variables. There were no significant interactions between gender and PIFS treatment.[11]

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[10] We acknowledge the limitations inherent in obtaining and comparing ratings of students generated by teachers who are participating in a study versus those of teachers who are not participating in a study. Obviously, demand characteristics could have affected the teachers' ratings. However, the student evaluation forms comprised the only data in this study that were teacher-generated. The bulk of our data consisted of assessments that were scored by individuals who did not participate in this research; who were blind to the hypotheses; and who did not know the students' names, classes, schools, or teachers. Hence, even if we ignore the teacher ratings, our conclusions are unaffected.

[11] The detailed data and analyses of gender differences are available from the first author.

TABLE 2

Study 2: Massachusetts Site Means and Standard Deviations with Significance Tests ($n = 321$)

Group	Variable	Reading practical	Writing practical	Homework practical	Testing practical	Reading academic	Writing academic	Testing academic	Practical-2 summary (R, W)	Practical-4 summary (R, W, H, T)	Academic summary (R, W)
YEAR 1 ($n = 109$)											
PIFS ($n = 61$)	Pre	2.20 (.64)	2.01 (.57)	2.38 (.46)	2.02 (.58)	2.53 (.82)	2.39 (.72)	—	2.11 (.57)	2.13 (.52)	2.45 (.69)
	Post	2.47 (.55)	2.50 (.64)	2.48 (.58)	2.38 (.59)	2.92 (.71)	2.92 (.62)	—	2.46 (.53)	2.44 (.48)	2.88 (.60)
	Diff t	3.56***	6.17***	1.22 n.s.	4.52***	3.27**	6.10***		5.82***	5.72***	5.41***
Control ($n = 48$)	Pre	2.64 (.69)	2.29 (.57)	2.50 (.63)	2.27 (.63)	3.02 (.73)	2.60 (.74)	—	2.46 (.54)	2.42 (.51)	2.81 (.65)
	Post	2.52 (.73)	2.24 (.74)	2.23 (.56)	2.08 (.69)	3.22 (.78)	2.60 (.74)	—	2.36 (.68)	2.26 (.60)	2.91 (.64)
	Diff t	1.38 n.s.	$<$1.00 n.s.	2.64*	2.28*	1.51 n.s.	$<$1.00 n.s.		1.29 n.s.	2.52*	1.10 n.s.
Comp. of diffs.	F	3.76 n.s.	12.26***	6.94**	17.21***	$<$1.00 n.s.	14.73***		12.66***	22.38***	2.03 n.s.
YEAR 2 ($n = 212$)											
PIFS ($n = 144$)	Pre	2.30 (.75)	2.12 (.78)	2.44 (.76)	2.16 (.82)	1.95 (.72)	1.78 (.60)	—	2.23 (.70)	2.26 (.65)	1.90 (.58)
	Post	2.82 (.59)	2.54 (.76)	2.73 (.71)	2.66 (.83)	2.20 (.53)	2.01 (.60)	—	2.71 (.61)	2.71 (.59)	2.14 (.50)
	Diff t	7.20***	6.16***	4.29***	5.80***	4.05***	4.44***		8.37***	9.47***	5.59***
Control ($n = 68$)	Pre	1.88 (.73)	1.74 (.67)	1.95 (.59)	1.63 (.66)	1.50 (.60)	1.37 (.49)	—	1.78 (.60)	1.80 (.50)	1.39 (.46)
	Post	2.34 (.71)	2.23 (.76)	2.17 (.81)	1.92 (.80)	1.67 (.54)	1.49 (.57)	—	2.26 (.69)	2.13 (.60)	1.58 (.49)
	Diff t	4.70***	4.70***	2.20*	2.69**	1.93 n.s.	1.55 n.s.		5.51***	5.04**	3.02**
Comp. of diffs.	F	10.13**	1.09 n.s.	8.11**	14.93***	25.54***	12.37***		8.44**	18.62***	22.50***

*$p < .05$; **$p < .01$; ***$p < .001$.

Academic-intelligence measures. For Year 1, both PIFS and control students tended to show pretest–posttest increases. As compared to the control group, the PIFS group showed a significantly greater increase for writing; the covariate-adjusted posttest improvement was .44 points greater for the PIFS group compared to the control group, which is an 18% larger gain (over the sample's pretest mean) for the PIFS group. The control group began higher than the PIFS group (significantly for reading and for the summary score), and the posttest position of the groups depended on the curriculum component: For the writing-academic score, the PIFS group was higher at posttest, for reading-academic the control group remained higher, and for the academic-summary variable there was no significant difference between the PIFS and control groups at posttest.

For Year 2, the PIFS group showed significant pretest–posttest improvements. The control group did not change significantly, except for the academic-summary score. The PIFS group began significantly higher than the controls and ended significantly higher. Significantly greater improvement occurred for PIFS on reading, writing, and the academic-summary score. For the academic-summary score, the covariate-adjusted posttest improvement was .33 points greater for the PIFS group compared to the control group, which is a 19% larger gain (over the sample's pretest mean) for the PIFS group.

Practical-intelligence measures. In Year 1, the PIFS group showed pretest–posttest gains. The control group declined from pretest to posttest, with significant declines on some variables. There was a significant PIFS advantage for all practical variables (marginally significant for reading). The control group began higher than the PIFS group (significantly for all variables except homework), and at posttest the PIFS group generally exceeded the control group (significantly for testing and homework). For the practical-4 summary score, the covariate-adjusted posttest improvement was .38 points greater for the PIFS group compared to the control group, which is a 17% larger gain (over the sample's pretest mean) for the PIFS group (note that the control group declined).

In Year 2, the PIFS and control groups showed significant pretest–posttest improvements. The PIFS group began significantly higher than the controls and ended significantly higher. Significantly greater improvement occurred for PIFS in reading, homework, testing, and the practical-summary scores. Essentially, as with academic scores, the gap between PIFS and control groups grew wider from pretest to posttest. For the practical-4 summary score, the covariate-adjusted posttest improvement was .33 points greater for the PIFS group compared to the control group, which is a 16% larger gain (over the sample's overall pretest mean) for the PIFS group.

Teacher (or class) differences. In Year 1, except for the reading-academic variable for PIFS teachers (classes), there were no significant differences between PIFS teachers (classes) on the pretest–posttest effects. All PIFS teachers (classes) showed positive pretest–posttest gains. There were no significant differences among control teachers. In Year 2, there was significant variability among PIFS teachers (classes) on the academic and practical variables, except for homework-practical scores. There was also significant variability among control teachers (classes) on the academic variables, reading-practical, and practical-2 summary scores.[12] However, all PIFS teachers showed positive pretest–posttest gains.

Overall Summary of Studies 1 and 2

In general, the PIFS program successfully enhanced practical and academic skills. Positive results were observed in both years of the program in Studies 1 and 2 at the Connecticut and Massachusetts sites. The first-year results varied depending on the curriculum component, with PIFS advantages occurring for practical variables in particular. Consistently significant benefits of the PIFS curriculum were found for practical and academic variables in Year 2 at both the Connecticut and Massachusetts sites. The PIFS effect occurred across a variety of initial conditions in which the PIFS group at pretest scored lower than, equal to, or higher than the control group. In general, there was no interaction between PIFS treatment and gender (with a few exceptions for the Massachusetts-site's Year-1 data), and there was consistency of the pretest–posttest gains across the PIFS teachers (classes).

RESULTS AND DISCUSSION OF QUALITATIVE DATA

The pretests and posttests provided a way to quantify the enhancement of students' practical intelligence over the course of the year. However, these numbers provided us with only part of the picture. We also wanted to track gradual changes in students' actual behavior, in their attitudes toward school and toward themselves, and in classroom dynamics. We wanted to gauge teachers' changing sense of the project and how they used it to enhance their normal curricula. In addition, we wanted to understand the conditions that best promote a PIFS implementation and, by extension, any attempt to train practical thinking skills.

To harvest this kind of information, we observed classrooms regularly, writing detailed ethnographic descriptions of what we saw. In informal conversations, we reflected frequently with teachers on the PIFS program and its effects on students. At the end of the school year, we also conducted formal interviews with all the teachers and with students selected at random from PIFS classrooms. We asked both teachers and students to reflect on the quality of their PIFS experiences. Students also were asked a series of general questions about PIFS skills and each of the focal areas. The student interviews each lasted about 30 min, while the teacher interviews were more free-ranging, lasting up to 2 h. From all of these data, we gleaned insights about the value of PIFS and the conditions that foster the most effective implementations.

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[12] As was the case with the Connecticut data, and for the same reasons, we do not present detailed analyses of teacher (class) differences here. These data are available from the first author.

Effects of the Curriculum

1. Acknowledging students' outside-of-school skills enhances student self-esteem and respect for peers. Lessons in the introductory booklet ask students to reflect on things they do well outside of school and to demonstrate for the class a special talent or skill. In virtually every class, these lessons yielded an array of interesting and adept demonstrations from many students and many surprisingly energetic and talented performances from students who usually did not participate in class activities.

These lessons allowed teachers to see previously unacknowledged strengths in students and enabled students to build more distinctive and accurate pictures of themselves and of one another. The respect and esteem engendered by such demonstrations was evident both in the interviews and in classroom interactions. Teachers and students referred to these lessons as being the most memorable and among the most important of the curriculum. Several teachers commented with surprise on the skillfulness of their students' demonstrations, saying that the performances helped them to appreciate better the students who were less academically inclined. In their interviews at the end of the year, students recalled with great accuracy the demonstrations given by their classmates at the beginning of the year. Commented one poor academic performer: ''It's wrong to think we're all smart in the same way. I can fix things and that makes me smart in my own way. And it's an important way.'' Another student remarked: ''I always thought John was just kind of dumb. I didn't know he could put together tape recorders like that.'' One teacher pointed out, ''Those lessons were crucial to the development of students' self-esteem. They legitimized what students *can* do well, rather than focusing on things they need to learn to do better.''

A good example of the potential value of acknowledging students' outside skills was provided by one boy, who entered class late in the term and who immediately showed evidence of physical and emotional neglect. Academically, the boy was performing poorly, and he suffered from outbursts of temper when he became frustrated. During a PIFS lesson, the boy impressed the teacher and the class by disassembling, fixing, and reassembling an electronic appliance, while explaining what he was doing (at the teacher's urging). This experience of success encouraged the boy to work harder in other subjects as well, and the teacher was gratified to be able to praise the child for his legitimate (although usually untapped) abilities. Another child, a sixth-grade girl, came out of her shell when she brought to class a miniature and elaborate dollhouse she had built. The recognition and encouragement she received for her first-rate performance in building the dollhouse encouraged her to invest more energy in other more academic curricular areas in the future.

2. Harnessing extraschool strengths and interests in the service of school work can serve as a powerful motivator, particularly for students not inclined to academics. While the simple acknowledgment of their strengths and talents did much to improve students' self-esteem, those strengths also served as a hook to engage students in school work. Several teachers allowed students more freedom to be guided by their own interests in carrying out school work: An avid fan of airplanes did a book report on the Wright brothers; an artistically inclined student used drawings to take notes, to organize her thoughts before writing, and to illustrate her essays. In such instances, students reported greater satisfaction in doing school work, and teachers usually were pleased with the results from typically lackluster performers. In situations in which students normally would have ''tuned out'' and simply not bothered to do homework, creating an opportunity to write about what interested them was the hook that kept them involved.

One child with a lust for video games and computers was encouraged by the teacher to harness his fascination with computers in service of his schoolwork. The boy researched the background leading up to the computer revolution for history class, wrote a short story about a boy who became addicted to computer games for writing class, and designed his own mock computer game for science class. The value of the PIFS approach here was in helping the boy benefit from doing what he enjoyed by borrowing from his topic area of interest while completing other assignments in seemingly unrelated areas.

When it works, this activation potential is probably the most powerful aspect of the PIFS curriculum: its capacity to help otherwise-disengaged learners to involve themselves in the standard curriculum in a way that is meaningful to them. However, this is not an easy tactic to negotiate, either for students or teachers, and it happens less frequently than we would like. It requires the teacher to allow students a certain amount of freedom in carrying out their assignments. It requires that students have enough self-confidence and self-knowledge to use this freedom to advantage. While the results of this stretch from school to personal lives are impressive, getting such results with any regularity probably involves more than a year's worth of practice for teachers and students too used to fulfilling the letter, and no more than the letter, of the school law.

3. Basing skill-building on students' own experiences and inclinations gives all students the same opportunity to participate in class and to develop those skills. Consistent with the above-mentioned emphasis on helping students assume responsibility for developing their own best ways of doing things, many PIFS lessons ask students to talk about their particular strengths, problems, and past experiences in carrying out various kinds of assignments (e.g., studying for tests and reading difficult passages). Since all students—not just the strong academic performers—have such experiences to share, PIFS lessons often afforded low-achievers the chance to speak and be heard. Rather than the best academic students dominating class time, PIFS helped put other students on a more equal footing with them.

In every class, teachers and researchers observed usually passive students—students who never offered much in standard class discussions—taking active roles in PIFS discussions, sharing their experiences with a particular problem or solution, and suggesting strategies to other students. The effect of this change on classroom dynamics was tangible. PIFS seemed to perform a similar function in reducing gender differences in typically male-dominated classes such as mathematics. Despite the fact that girls are not usually as assertive as boys in math classes, girls at several of the sites showed an increase in their participation in math over the course of the year.

Compared to the abilities emphasized by traditional academic curricula, PIFS focuses on a more robust group of abilities as being relevant for school and life performance. Thus, with PIFS, students who are not usually as involved become more involved—they have something to contribute, rather than sitting on the sidelines and letting the ‘‘brains’’ do all the work. The ‘‘brains’’ also learn that others have worthy ideas. Some of these ‘‘brains’’ also realize that their ability in academics is not mirrored in other practical skills areas. This is a positive aspect of the curriculum for all students, since everyone must learn to respect others with varying talents and since both the academically and the practically competent children often have significant, although different, skills.

4. PIFS skills become lasting and useful tools for learning only when students can see the tangible results of their efforts to employ them. PIFS runs the risk of becoming like other aspects of the school curriculum that students memorize dutifully, regurgitate faithfully on a test, and promptly forget. PIFS skills become useful and lasting tools only for those students who see concrete benefits from using these skills. Students continue to draw on memory techniques when they see their scores on vocabulary tests improve. They continue to take notes long after the note-taking lessons are over when they learn that it makes report writing easier.

But such changes and improvements in students’ work come only gradually over the course of the school year. This fact emphasizes the importance of the many opportunities PIFS gives students to reflect on their work and their progress. Through journal writing, reflection discussions, peer feedback, and the like, the PIFS curriculum offers students many ways to track their small improvements, allowing them to see progress before it yields the impressive differences that many students ultimately describe.

5. PIFS skills seem to endure. We have evidence suggesting that PIFS skills endure and that the curriculum creates lasting impressions on students. Teachers we interviewed whose students were taught PIFS during the previous year noted that these students remembered and applied aspects of their PIFS experiences to their new classroom setting. These students suggested research and project topics that called on outside interests. They exhibited well-developed and effective note-taking, studying, and test-preparation strategies. They saw the big picture when they wrote—understanding the needs to plan, create, and revise. They asked teachers to be specific about course and instructional objectives and requirements. In general, PIFS students a year later seemed to have been assisted in their transfer to middle school by their PIFS skills. (Of course, these are impressionistic data, and we lack a direct quantitative comparison of the tendency of PIFS graduates to display these behaviors as compared to control-group graduates.)

Lessons about Implementation

In the process of working with teachers, we learned about the circumstances that fostered or hindered the implementation of the PIFS curriculum.

1. Flexibility in implementing the curriculum is essential. Whereas all teachers completed the introductory lessons first, they then followed the dictates of their own needs in deciding how and when to carry out lessons in the other focal areas. This flexibility in the implementation of the curriculum had several advantages: First, it invited teachers to take an active role in planning and carrying out the PIFS curriculum. Second, since the PIFS lessons were being used to meet real and pressing needs, such flexibility helped to secure sufficient time for PIFS in the always-busy school day. Finally, the fact that teachers could choose lessons to complement their standard curriculum ensured that students would use PIFS in the context of their standard school work—a necessary condition for the students to internalize the principles and skills advocated in the PIFS curriculum.

2. PIFS is a tool for teacher reflection and change. The process of adapting PIFS to the standard curricula proved to be an important, difficult, and thought-provoking venture for teachers. Many commented that PIFS helped them systematically to address issues they always had believed were important but did not always have time to teach. Several found that having to be explicit about their expectations for students was a useful exercise—they realized they had some expectations they never fully articulated to students. Others found that identifying the central lessons in the PIFS curriculum was a good way to set their priorities. Useful though it is, this process of reflection and revision of practice is as slow and difficult for teachers as it is for students. For example, one teacher learned that although her students did, in fact, know the material quite well, the format of several test questions had puzzled them—leading to generally poor performance on the test. For instance, many could not read a graph that she had included with one question. Others were stumped by unfamiliar phrases or words.

This teacher came to appreciate that it was the lack of PIFS skills—knowing *how* to take a test—and not lack of content knowledge that was keeping her students from performing well. Before the next test, she spent more time talking with her class about the types of questions and format of the test. The students did remarkably better. It was a rewarding experience, but a time-consuming one. Real progress came only after this teacher had taken considerable personal and class time to explore the problem, reassess and adjust her own practice, and then guide the students in readjusting their approaches to studying and test taking.

PIFS offered teachers the chance to reflect on the assumptions and values implicit in their practice. Two teachers commented that after many years of teaching in an environment that defines intelligence primarily through test scores and academic achievement (strictly defined), they had tacitly adopted this belief themselves. Because of this emphasis on strictly ‘‘academic’’ intelligence, the teachers believed that they sometimes failed to recognize children’s abilities when these abilities were in the practical or creative domains. Thus, PIFS exercises and lessons designed to help students and classmates focus on abilities in other domains had a fortunate side effect: These lessons also encouraged teachers to broaden their focus and their assessment of students to include a broader definition of intelligence. All students benefit when teachers expand their views, since teachers are then better able to prepare students for the world outside of school, where many types of intelligence are important.

These teachers also pointed out that PIFS had provided them with valuable lessons for personal development. Despite being veteran teachers, they reported that they often forgot just how different from their own were their colleagues’ expectations of students. These teachers noted that the PIFS emphasis on articulating teacher expectations and explicit criteria for good student performance forced them to examine critically aspects of their own views on teaching they generally took for granted. The PIFS group meetings, where teachers discussed their experiences with the curriculum, provided a forum for teachers to discuss their implicit expectations and views, which were now made explicit. Realizing how different they were from one another was instructional and beneficial in that it alerted teachers to the types of problems students face as they move from teacher to teacher, both as they advance in school and as they move within a grade from class to class. How confusing it must be to an 11-year-old, one PIFS teacher remarked, to recalibrate her understanding, expectations, and internal rules to fit different teacher expectations.

Because of this experience, these teachers vowed to examine their implicit assumptions more often and revise them if warranted. They also committed to making these assumptions explicit for students by discussing them early in the term and repeatedly at appropriate points. During sessions devoted to articulating their expectations of students, these teachers solicited students’ input about these expectations: Did anything seem unfair to the students? How could the teacher improve his or her outlook? The value of this evolving process was in promoting teacher refection and improvement, as well as in improving student understanding of the expectations by which they would be judged. Students were also given input into the system, which consequently came to be perceived by them as more nearly fair. With so many aspects of school life usually left tacit now out in the open, everyone could be assessed fairly. PIFS was the catalyst for this improvement.

3. The stand-alone and infused lessons play complementary roles. The stand-alone (mostly introductory) lessons were welcomed by teachers far more readily than we expected them to be, at least at first. Although these lessons took time away from the standard curriculum, they seemed to offer teachers a simple and straightforward way to introduce new skills and ideas to their students. However, as the year progressed, teachers seemed more interested in those lessons that would fit well with their students' traditional school work.

This fact did not make infusion easy. Although teachers could *plan* to incorporate PIFS skills into particular lessons or projects, many did not do so spontaneously as opportunities arose in class to reinforce skills that already had been taught. This is partly because all the PIFS teachers were experienced and quite effective in their classroom practices: They already had a repertoire of responses to particular situations and questions. It is also a function of the length of the PIFS curriculum. There are so many skills and ideas covered that the ones introduced at the beginning of the year may lie dormant for several weeks while new ones are being introduced and reinforced.

4. PIFS taught in a middle-school cluster situation has both advantages and disadvantages when compared to the elementary-school self-contained classrooms. With more and more sixth grades being included in middle school rather than elementary school settings, it is useful to consider the implementation issues that arise in the team-taught cluster situation (the most typical middle-school organization). In this setting, four teachers (one for each of the core participants) teach four classes of students who rotate among the teachers while keeping the same classmates. From a PIFS perspective, such a situation offered several advantages.

First, since the team of teachers shared common planning time, there was ample opportunity for them to talk with each other about the progress and implementation of the PIFS program. This collaboration proved especially helpful when particular lessons seemed ineffective or when students did not respond to an apparently engaging topic. The teachers supported and encouraged one another in a way that researchers who are not ''in the trenches'' often cannot. And since they all knew and taught the same students, they were able to make suggestions to each other about how to handle particular children or situations. Second, because the students move to different classes for different subjects, the issue of identifying differences among the various subjects becomes an easier one to address.

However, the organizational difficulties of a team-taught cluster of classes prevented us from taking more advantage of this opportunity. The PIFS curriculum was built around four focal areas—reading, writing, homework, and test-taking—skills that are used in all core subject areas. Deciding how to divide the PIFS lessons effectively among four different teachers and then orchestrating follow-up activities in the other three classes proved difficult at best. The teachers of the self-contained classrooms were able to do follow-up lessons more effectively and consistently.

In conclusion, the combined quantitative and qualitative results of this set of studies provide empirical evidence supporting the importance of practical intelligence for school in students' school success.

GENERAL DISCUSSION

The Practical Intelligence for School project showed that practical skills essential to school success can be defined and taught. This is welcome news for students who fall short of their potential because they lack basic practical insights into their teachers' expectations and how to fulfill these expectations. For teachers, the possibility of training practical intelligence for school may mean less frustration with students who do not perform satisfactorily due to an array of factors not related to lack of analytical ability. The PIFS program provides one method for and approach to training these essential practical skills: Students exposed to PIFS become better able to make optimal use of their gifts and abilities within the context of the school environment, while learning practical skills they can use throughout their lives.

Over the past several decades there have been various trends favoring different types of curricular approaches and interventions. Sometimes, curricula are developed and implemented on the basis of ''anecdata,'' or anecdotal reports, instead of carefully controlled studies. For example, a recent trend in educational intervention has focused on building emotional and moral intelligence (Coles, 1996). Lately it is often said that we must educate our youth for character and moral values (e.g., the ''Character Counts'' curriculum in use across the United States). Certainly we are not suggesting that there is anything wrong with wanting children to develop character and morality! However, the questions of exactly how to accomplish this goal (or any other educational goal), and of how to know if we are succeeding with any individual program, can only be answered in a scientifically adequate way through empirical research.

Unlike the latest fad that sometimes becomes a curricular intervention in the absence of a solid theoretical foundation and rigorous supporting data, the PIFS program is rooted in theory and based on hard empirical evidence. Our data show something meaningful and promising by providing evidence that it is possible to improve broad-based intellectual skills. By focusing on reading, writing, homework, and test-taking ability, we cast our net wide in an attempt to create meaningful changes in broad areas of students' intellectual performances.

As already discussed, there has been widespread disagreement regarding the degree to which children's intellectual capabilities can be modified. For example, Herrnstein and Murray (1994) essentially dismissed intervention effects, arguing that short of adoption, there are no meaningful ways to raise the intellectual performance of children. Although future research is needed to assess the long-term durability of training in practical intelligence, our data show reasonable increases over the school year. Thus, on the topic of the controversy regarding potential intervention effects, we weigh in on the side of cautious optimism. In the very least, our data suggest that further research on increasing practical intelligence is warranted.

A broader issue raised by this research concerns the definition of intelligence itself and how one's definition affects one's viewpoint regarding the modifiability of intelligence and how best to enhance it. On the theoretical side, a growing literature suggests that traditional *g*-based psychometric conceptions of intelligence are incomplete. Interest in the type of intelligence people use to solve real-world problems, referred to here as practical intelligence, has led to a broad cross-section of studies identifying practical intelligence in different domains (Ceci, 1996; Rogoff & Lave, 1984; Scribner & Cole, 1981; Sternberg & Wagner, 1986, 1994; Sternberg, Wagner, & Okagaki, 1993; Voss, Perkins, & Segal, 1991) and even studies showing that practical intelligence can be assessed and taught (see Sternberg, Forsythe, Hedlund, Horvath, Wagner, Williams, Snook, & Grigorenko, 2000; and Sternberg, Wagner, Williams, & Horvath, 1995, for reviews).

Thus, theoretically speaking, a psychometrically based measure of intelligence such as *g* may not be the whole story when it comes to understanding children's intelligence, even though it accounts for far more of the variance in grades and scores than do any of the specific factors subsumed under *g*. Practically speaking, psychometrically based *g* may not be sufficient if we wish to be fair and accurate in our assessment of children's capabilities in the classroom and beyond. Just as Renzulli (1986) has argued for a broad-based approach to identifying giftedness—in which children are identified based not only on above-average ability, but also on high levels of motivation and creativity—we argue for a broad-based approach to identifying school-based competence. We believe that practical intelligence should be seen as an essential component of children's competence, worthy of assessment and instruction in its own right. Our research suggests that training in practical intelligence can help children remediate areas of weakness, as well as build on existing skills, to improve their performance in many academic areas.

The evidence regarding the modifiability of *g*-based intelligence is mixed. But if we can accept that intelligence is more than *g* (and the attendant specific factors revealed by factor analysis of test scores, such as visualization ability, memory, and perceptual speed), there is hope that meaningful increases in intelligence can be achieved, even if (for example) these increases do not focus on *g*-based abilities. Thus, putting aside one's point of view regarding whether we can affect measures of *g* through training, our research shows that we can affect measures of practical intelligence through training. Whether one wishes to call practical intelligence a type of intelligence, a type of knowledge, a set of skills, or whatever, the point is that it can be delineated and taught successfully, and it has real consequences for school success.

Theoretical arguments aside, then, we would advocate further research on training of practical intelligence, regardless of how the concept fits into one's particular view of intelligence, because of the increases in school performance that result from such training. The training of practical intelligence may be particularly useful in challenged populations because students in these populations may have had little opportunity to acquire school-relevant practical intelligence on their own or at home. Training challenged students may help them to overcome a deficit in school-related knowledge and skills that could otherwise have derailed them. Many of these students may have latent capabilities that they have not harnessed or profited from because of a lack of fit between the student and the school environment. By helping students understand what is expected of them and why, and by demystifying the process of succeeding in school, training in practical intelligence may help to reach students who have previously opted out of the school experience.

In conclusion, we have shown that practical intelligence can be identified, assessed, and taught in order to achieve meaningful increases in real-world success in the classroom. We advocate further research on practical intelligence for school to broaden our appreciation and understanding of this construct and its applications in the classroom.

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